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THERE MUST BE A REASON!

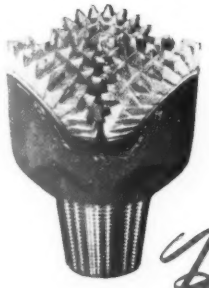
CASE HISTORY

TXL FIELD

Ector County, Texas

84%...OF ALL THE ROCK BITS

used in its development were Hughes



In the TXL Field, Ector County, Texas, Hughes Rock Bits are again the choice of driller. The discovery well in this field was completed in 1944 and is now producing at a depth ranging from 8000 to 9600 feet. Chert is often encountered immediately above the pay zone and as many as twenty to thirty bits are required to penetrate. Drilling time averages 80 to 90 days per well and approximately 80 rock bits are needed. The fact that 84 per cent of all the rock bits used were Hughes is testimony to the quality of Hughes products.

Hughes TOOL COMPANY • HOUSTON, TEXAS

Standard of the Industry

PRICE 20 CENTS

TABLE OF CONTENTS PAGE 57

MARCH 16, 1946

POWER

Lane-Wells Gun Perforator

CHECK THESE DESIGN AND CONSTRUCTION DETAILS . . . THEY PROVE THAT POWER FOR DEEPER PENETRATION DRIVES EVERY BULLET.

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—which seals out well fluid and any possible contamination, disintegrates when hit by the bullet, leaves no debris in hole to foul test tools, packers or chokes.

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an original Lane-Wells development is scientifically designed to give a stronger point, to reduce tumbling, to reduce burr and thus to increase penetration.

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Subscription rate to the petroleum industry, United States and foreign, 1 year, $3.00. Single copies, 20 cents. Back copies, when over a year old, 50 cents. Note: Payments from outside the U. S. A. may be in the form of an international money order or check on a U. S. A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879.

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Vol. 44, No. 45 March 16, 1946

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Table of Contents

NEWS DEVELOPMENTS

Drive Against OPA Intensifies; A.P.I. Joins Fight 60
Delay in Oil-Treaty Hearings Misinterpreted, Davies Asserts 61
Weber Opens Journal's Dallas Office 61
Pauley Incident Simmering Down to Minor Political Squabble 62
Settlement of Steelworkers' Dispute Brightens Bit Outlook .. 62
Unexpected Occurrences Caused Bureau Error in Forecast ... 64
International News 65
Guarico's 1946 Exploration Program Is Most Extensive 66
Crude Increase Warmer Weather, Bolster Refinery Market .. 79

Editorial 59
This Week 63
Deaths 79
Natural-Gas News 131
Natural-Gasoline News .. 131
Refining News 132
Pipe-Line News 134
Statistics and Trends 136

ENGINEERING AND OPERATING

Waste Hot Gun-Barrel Water Heats Tank Bottoms 82
Electronic Control Features A.I.Ch.E. Meet 85
Corrosion by Hydrofluoric Acid 87
Modern Refining Processes—Part 3 103
Questions on Technology 115
Device Expedites Removal of Old Pipe Lines 116
Book Reviews 118
Engineering Fundamentals 121
The Refiner's Notebook 123
Oil and Gas Equipment Digest 127

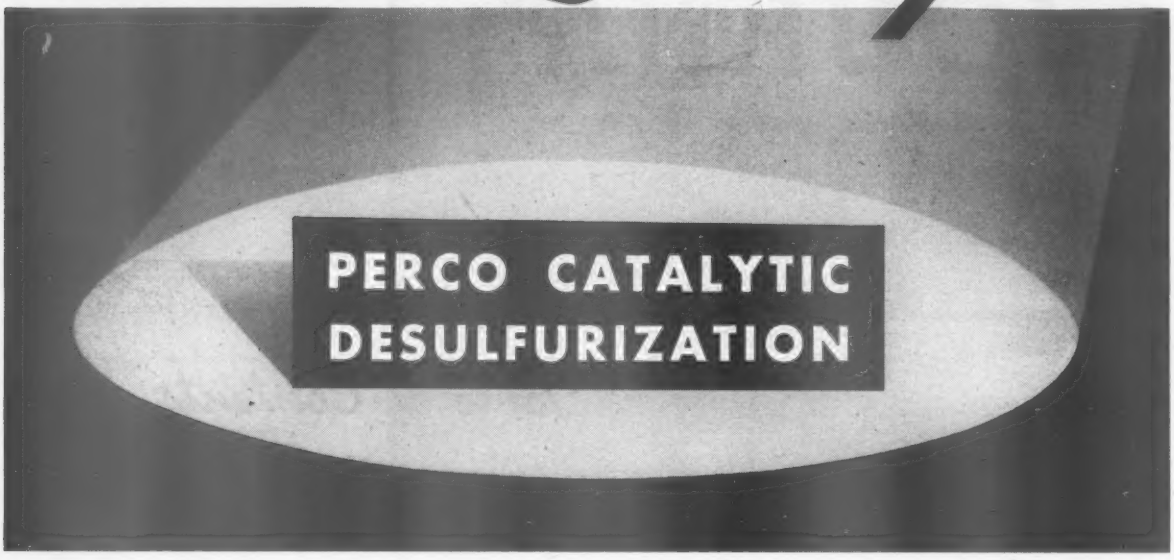
EXPLORATION AND DRILLING

Weekly Well-Completion Record 136
Daily Average Production for Week 137
Solving West Texas Problems 139
Reports by Areas Start on Page 139

ADDITIONAL FEATURES

Market Summary 136
Crude-Oil Prices 136
Calendar of Events 153
Drilling Contractors 154
Personals 156
Equipment Men in News 158
Classified Advertising ... 159
Index to Advertisers 162

In the Limelight



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THE OIL AND GAS JOURNAL

The Answer

THE only answer to OPA's promise of a 10-cent advance in posted crude-oil price schedules is for operators everywhere to rally to the support of those who will present this industry's case to Congress, looking to the ending of all petroleum price controls. If doubt existed in anyone's mind as to the desirability of doing away with oil-price regulations, surely the latest act of the pricing agency is conclusive of what has to be done.

The promised 10-cents-a-barrel increase follows the presentation of a carefully prepared analysis of production costs by the National Crude Oil Industry Advisory Committee composed of representative executives and technicians. There were no data presented indicating that a 10-cent increase would solve any present or future problem of those who have the responsibility of finding and producing crude oil. It can only be concluded that the extra dime is a sop offered in the hope that it will weaken the long-suffering industry's opposition to federal regulation by price.

OPA did not challenge the analyses of the advisory group. The agency paid no attention to the committee's findings of greatly increased replacement costs and based its action on current costs and production. The life of any large or small oil company which attempted to establish long-range operating plans by an occasional look at its current bookkeeping would be short. Current profits come from planning in which a company makes sure that its new discoveries will assure an economic operation many years in advance. It is that foresight which in the past assured that petroleum consumers always had sufficient supplies including the emergency requirements of a world war.

This was what the advisory group was trying to get across to OPA officials when it talked about the substantially higher replacement costs from which future adequate supplies will come—but it got nowhere.

The foregoing is only part of the record. OPA says that refiners will have to absorb the 10-cent advance. Most of these refiners have just absorbed additional wage increases of 15 or more per cent along with generally higher prices for everything they buy. Furthermore, the returns from their money product—gasoline—have decreased from the war period.

But Washington, anxious to have one major product to which it can point in support of its so-called anti-inflation program, insists that consumer and wholesale prices for oil products must continue at prewar levels except for those temporary advances which OPA in its omnipotence sees fit to make effective. Fortunately, members of Congress and their constituents are tiring of this type of political strategy and a united industrial front will end these activities and oil prices will once more be determined by fundamental operating conditions.

Drive Against OPA Intensifies; A.P.I. Officially Joins Fight

by Henry D. Ralph

WASHINGTON. — The 10-cent per barrel increase in crude price ceilings granted by the Office of Price Administration last week won't get the oil industry off the neck of that agency.

Instead, the industry is preparing to fight even harder to get Congress to knock out all price controls over petroleum in enacting the law to continue OPA's life for another year beyond June 30.

For the first time in the long years of the crude price battle the American Petroleum Institute is officially taking a hand. Walter S. Hallanan of the Plymouth Oil Co. heads an A.P.I. committee of seven which is currently working up a presentation to be made to the House and Senate committees on banking and currency in support of amendments to remove oil from price control.

Other members of the committee are J. F. Drake, Gulf Oil Corp.; Eugene Holman, Standard Oil Co. (N. J.); B. Brewster Jennings, Socony-Vacuum Oil Co., Inc.; B. L. Majewski, Deep Rock Oil Corp.; J. Howard Pew, Sun Oil Co., and Robert E. Wilson, Standard Oil Co. (Indiana.)

This committee is following out instructions from the A.P.I. board of directors (1) to explain the present supply and demand situation in the oil industry and the unbalances and inequities created by the operation of peacetime control; (2) to summarize the fundamental difficulties with and bad effects of price control in peacetime, and (3) to urge and supply the information which justifies prompt elimination of price control in the petroleum industry.

OPA Continuance Almost Certain

This is exactly what a committee of the independent Petroleum Association of America has been working on for some time. The House committee has been holding hearings on the OPA bill for more than a week, but only supporters of price control have appeared as yet, and dates for hearing the oil industry spokesmen have not been scheduled.

Congress is virtually certain to vote continuance of OPA in some form. If political opposition to removing oil from control entirely becomes too strong for Congressmen to buck there is an excellent chance that the new law will include formulas for price relief which would remove many of the industry's complaints of the way OPA has been operating. Such language would apply to all commodities without naming any and would require OPA to raise price ceilings under stipulated conditions and to remove them under other situations.

Typical of this trend is the report issued last week by the special House committee on postwar economic policy, which "reluctantly" recommended continuation of price control as the lesser of two evils—the other being ruinous inflation. But this committee urged a number of important changes to improve OPA administration, including a requirement that OPA drop controles over any commodity meeting standards written into the law, such as when acute demands have been met or when production is maintained at a designated level for a certain period of time.

Where controls are retained, this committee recommended that OPA use the best of the prewar years rather than the 1936-39 average as the standard for earnings and profits, and that prices permit the recovery of total costs of production.

OPA based its 10-cent crude price increase on an industry showing that earnings of producers are now below the 1936-39 average, but it did not include cost of finding new oil as a cost of production. Adoption of legislation such as recommended by the postwar policy committee would require OPA to make further increases in petroleum prices if not complete removal of ceilings.

Further Increases Possible

Even without new legislation OPA may grant further crude price increases as a result of the "spot check" cost surveys it proposes to conduct immediately, but no such action will mollify producers who are out for OPA's blood and insist on complete "decontrol" of the oil industry.

Until now OPA has professed to be much concerned with increases in consumers' living costs which would be caused by any increase in prices of petroleum products. That was the justification for the stripper well subsidy and the requirement that refiners absorb crude price increases permitted in various fields. But that "hold the line" argument is no longer valid, because OPA now must permit increases in product prices.

Refiners are currently discussing prices with OPA and under the new wage-price policy they can demand and get price increases sufficient to cover the 18 per cent wage increases recommended by the Government's factfinding board and also other increases in materials and operating costs as well as the 10-cent advance in crude.

This doesn't mean that the lid is off oil prices, but it has been pried loose a bit. Now that OPA can no longer hold oil prices to a mark on a cost-of-living index chart there is some possibility that it will permit enough of a "bulge" in the line to take the squeeze off of producers and refiners.

Crude Increase Blasted From All Directions

There were no kind words for the Office of Price Administration during the week. Its 10-cent a barrel crude price raise was met with near universal condemnation, particularly from the producers. A summary of the public statements:

"Totally inadequate"—B. A. Hardey, president of the Independent Petroleum Association of America.

"Just a bait"—H. P. Nichols, executive vice president of the East Texas Oil and Gas Association.

"Only an opproach to simple justice"—Beauford Jester, member of the Texas Railroad Commission.

"Not satisfactory to the independent producers"—J. P. Coleman, president of the North Texas Oil and Gas Association.

"Ridiculous"—Charles F. Roeser, chairman of the OPA's crude oil advisory committee.

"Crumbs tossed in the way of appeasement"—Glenn H. McCarthy, Houston independent producer.

"Belittles the intelligence of the people of Texas and the oil producers"—Fred Shield, president of the Texas Mid-Continent Oil and Gas Association.

"A belated confession that crude ceilings have been too low"—James V. Allred, former Texas governor.

"Nothing more nor less than a sop . . to head off the industry's opposition to a continuation of price control . ."—Rush M. Blodget, executive vice president of the Oil Producers Agency of California.

A.P.I Forming Agricultural Development Committee

NEW YORK.—An Agricultural Development Committee of the American Petroleum Institute is now being formed, principally for the purpose of determining new uses for oil on the nation's farms. The committee's work with farm organizations and government agencies reportedly will be made public without charge. Personnel on this committee is to be announced later.

Delay in Oil-Treaty Hearings Misinterpreted, Davies Asserts

WASHINGTON. — Backers of the Anglo-American oil treaty vehemently deny that delay in hearings before the Senate foreign relations committee indicate that they despair of ratification, but privately they admit that the delay is not doing their cause any good.

The treaty was signed in London last September 24, but didn't reach the Senate for several weeks, and by that time the committee's calendar of business made it inadvisable to start hearings prior to the Christmas recess. Then Chairman Tom Connally of Texas was out of the country attending the United Nations Organization conference. Hearings were finally set for March 4 and then suddenly called off with the explanation that State Department officials were too pressed with other important matters to prepare their presentations. A better explanation is that Congress was just beginning consideration of the British loan proposal and the State Department thought it might be inadvisable to have two British agreements being tossed around at the same time.

Meanwhile, opposition has been growing. For some time after the new treaty was signed scarcely a voice was raised against it, and it appeared that Senate ratification would be routine. Officials claim that the growing chorus of criticism of the treaty is an "inspired" campaign which can easily be answered and which does not constitute a serious threat to ratification. Nevertheless they have taken note of the opposition statements that postponement of the hearings means the treaty is dead, and the committee will be asked to set another date for hearings in the very near future.

Charges "Synthetic" Opposition

Ralph K. Davies, acting petroleum administrator, issued a formal statement denouncing the opposition as "synthetic," "inspired," and "none-too-scrupulous," and asserting the treaty would not be "sabotaged."

"The fact is," Davies said, "that the best heads in the oil industry, representing large companies, small companies, and individual operators, spent more than a year in devising a document which would prevent just those things. I think it clear that it does prevent them. So does our general counsel, Robert E. Hardwicke of Fort Worth, Tex., an able and experienced attorney. So do the many outstanding attorneys within the oil industry, as well as distinguished counsel outside the industry, including Judge Manley Hudson, former American member of the Permanent Court of International Justice.

Agreement Carefully Drawn

"The Anglo-American petroleum agreement was very carefully drawn on the basis of extensive consultation with industry and with interested government departments. The petroleum industry committee on national oil policy representing a cross section of the American oil industry, under the able chairmanship of A. Jacobsen, president of the Amerada Petroleum Corp., devoted weeks and months to this project. The document that has been signed is distinctly favorable to the American oil industry —all branches of it—and, what is more to the point, it advances and protects the interest of the American public.

"An inspired opposition is endeavoring to create fears through erroneously representing that the treaty would open the way to increased American imports at the expense of domestic production. The claim is completely without foundation. No part of the treaty contemplates anything of the kind. To the contrary, the order, stability and international cooperation which is its purpose, will afford the best possible protection against that very thing.

"At the proper time, before the foreign relations committee of the Senate, we will make a full statement of our position in support of the agreement. Upon that occasion, opportunity will be given to those who may have any questions concerning the matter to present their viewpoint. I am confident that we can establish quite clearly the merits of the agreement. It represents a distinct step forward in international oil relations."

Weber Opens Journal's Dallas Office

GEORGE H. WEBER, who returned to the Journal last month following nearly 4 years of service with the Armed Forces, has opened the Journal's new editorial office at 913 S. St. Paul Street, Dallas, from which office he will contribute engineering and operating material to the pages of this publication.

Weber graduated from University of Oklahoma in 1934, with the degree of Bachelor of Science in petroleum engineering. At the university he was a member of Tau Beta Pi and Sigma Tau, honor engineering societies. He joined the Journal shortly after graduation, working for a while in the Tulsa office. Later he worked as district editor at San Antonio, Houston, and Shreveport. While at Shreveport his interest turned particularly to cycling, and he developed some outstanding material on this phase of condensate production, much of which has been widely reprinted.

GEORGE H. WEBER

Weber's active duty in the Army started in August 1941. His Army service includes 3½ years overseas, in Fiji, New Hebrides, Solomon Islands, and finally in the Philippine campaign. He was at Luzon when the war ended. He rose from first lieutenant to the rank of major in the field artillery branch of the service.

Weber has already begun preparation of his first engineering material, and shortly his familiar byline will again appear regularly in the Journal.

Kansas Sets Gas Allowable

TOPEKA.—Allowed March production of 196,617,000 cu. ft. has been fixed by the Conservation Division of the Kansas Corporation Commission for the Cunningham field of Kingman and Pratt counties. February's allowable was 222,000,000 cu. ft.

Pauley Incident Simmering Down To Minor Political Squabble

WASHINGTON. — The "Pauley incident" is fast losing the aspects of a national scandal and is being looked upon as simply a minor political squabble.

Amid reports that he would ask withdrawal of his nomination as Under Secretary of the Navy if the Senate naval affairs committee would clear his name, Edwin W. Pauley, California oil man, undertook a vigorous rebuttal of the varied charges brought against him by Former Secretary of the Interior Harold L. Ickes, and others, and made out a plausible case for himself.

Ickes, too, returned to the witness stand last week, but failed to do Pauley any more damage. He admitted he had congratulated Pauley on being made secretary of the Democratic national committee, although he stuck to his opinion that Pauley should not have been its treasurer; that he entertained Pauley at a lunch in his office; and that he had not opposed Pauley's appointment as head of the Reparations Commission.

Pauley explained his side of the only serious charge against him—Ickes' contention that Pauley tried to bribe him with promises of campaign contributions from California oil men if he would drop his support of a lawsuit to test federal claims to tidelands. Pauley's story was that he outlined to Ickes the difficulties of raising campaign funds and listed a lot of administration actions that irritated business men, possibly including mention of the tidelands suit.

The other charges against Pauley seem to have been false clues or unimportant incidents magnified by Pauley's political and business antagonists. The hearings have produced a lot of rumors of unsavory business transactions, lawsuits, and political deals involving Pauley or his Petrol Corp., and Pauley's support of a California conservation act only after it was amended to suit him, but these would seem to be little more than the normal complications of ramified business activities.

Pauley's unsuccessful attempt to make a contract with the Mexican Government to construct a 100-octane refinery came into the hearings again and Pauley insisted this deal was blocked because of a former business rival, Max W. Thornburg, who was then petroleum adviser in the State Department, and Pauley pointed out that later the refinery was built with funds loaned by the U. S. Government but never got into production in time to assist in the war program.

Ickes' contention that no oil man should hold a government job having anything to do with oil also drew considerable opposition. Pauley devoted a good deal of his defense to the thesis that oil men in general are just as honorable and able as men in any other business, and that if they were good enough to run the nation's oil affairs during wartime they can be trusted in similar posts during peace. This thought was echoed by several others. Rep. Robert L. F. Sikes of Florida made a speech in the House in which he said:

"The fact that a certain group of both insiders and outsiders is aggressively advancing a philosophy which would bar practical oil men from Navy service most assuredly militates against one vital phase of adequate preparation. It is a preposterous doctrine which can only result in harm to both Army and Navy by perpetually denying them the services of men who most certainly could prove invaluable to their essential activities."

Ickes didn't help his own argument much, either, by an unsolicited crack to the effect that the Navy had lost 150,000,000 bbl. of oil from its Elk Hills naval reserve because "they didn't have sense enough to put down offset wells."

This brought a prompt rejoinder from Secretary of the Navy James Forrestal who pointed out that the loss was no more than 2,200,000 bbl. of royalty oil and took place prior to 1921.

Pauley also jumped on this statement as proving that the Navy needed oil men among its officials, pointed out that all contracts involving naval petroleum reserves must be approved by Congress, and again proposed that government oil be supervised by a joint committee of the Secretaries of War, Interior, and the Navy.

Settlement of Steelworkers' Dispute Brightens Drilling-Bit Outlook

HOUSTON steel workers, whose 7-weeks' strike has curtailed production of bits and other equipment for the drilling industry, appeared near settlement with the Reed Roller Bit Co. early this week.

Management and union officials held two conferences late last week. The company offered to effect an immediate 15-cent hourly wage raise with an additional 3½ cents later if the Government authorizes as much as a 15 per cent raise in company prices.

Hughes Tool Co., another major equipment manufacturer, also has been involved in the Houston dispute. Last week, Noah Dietrich, Hughes executive vice president, asserted that "for practical purposes, we do not have a strike at the Hughes Tool Co."

In a later statement, he said the company had employed 5,354 workers prior to the strike. "We now have about 4,400 workers, and 4,500 will give us our normal complement with production what it is today." The National Labor Relations Board is investigating a union charge that the company raised wages 15 cents an hour without dealing through its authorized bargaining agent. Early last week in Houston, union longshoremen left their jobs for a second time when steelworkers set up picket lines to prevent loading of cargo from Hughes Tool and Reed Roller Bit companies.

Other labor developments affecting the oil industry during the week included:

1. The Navy released to private management two refineries and one pipe line following settlement of labor disputes. Only three refineries and one pipe line were still under Navy control. Properties released were Crown Central Petroleum Corp.'s plant at Houston, Pure Oil Co.'s plant at Midland, Mich., and the south Texas division of Texas Pipe Line Co.

2. The National Labor Relations Board ordered Continental Oil Co. not to threaten reprisals against employes joining unions, question employes about union membership, or interfere with union activities. The order followed an investigation of a union complaint against statements and actions of a Continental superintendent in the Rincon field in Starr County, Texas, in 1944.

3. At the end of a series of conferences which were marked by harmony, Cities Service Oil Co. and the C.I.O. oil-workers union signed a contract in Tulsa providing for the now generally standard 18 per cent wage raise. The contract covers union members employed by the company in Oklahoma.

THIS WEEK

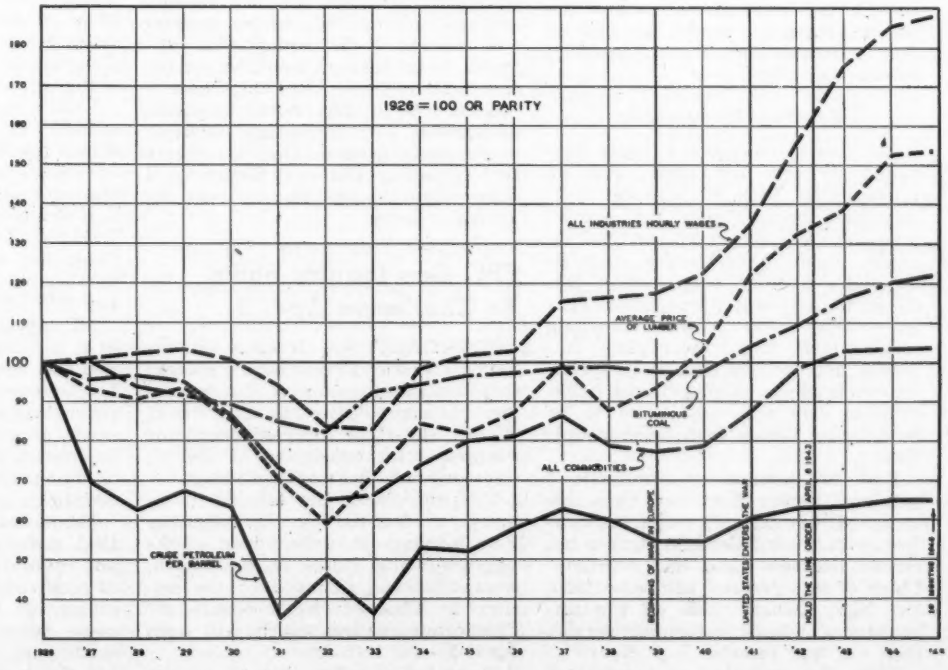
PRICES—Fury of the industry turned against OPA . . . Ten-cent crude hike pleased no one. . . . Producers consider it woefully inadequate. . . . Refiners up in arms at prospect of absorbing advance. . . . OPA restrains refiners from passing higher costs down to consumer level, unless policy is altered. . . . Order lifting crude ceiling expected March 18. . . . Meanwhile, refiners present data to OPA, supporting need for relief at consumer level. . . . ¶Higher crude costs arrest tendency of refinery-gasoline prices to drift lower. . . . Even distress material showing resistance to selling pressure. . . . ¶Industry advisory committee recommends 15-cent advance per barrel, for residual fuel, on East Coast. . . . Recommendation made as production stimulant to bring stocks and yield into balance with demand. . . . ¶A.P.I. takes hand in fight for elimination of OPA control over petroleum prices. . . . Walter S. Hallanan heads committee to assemble and present substantiating evidence. . . .

CONGRESS—"Pauley incident" shaking down into minor political squabble. . . . ¶House committee on executive expenditures will hear more testimony on WEP disposal. . . . War Assets Corp. has set no date for meeting with prospective buyers. . . . Surplus Property Administration recommendations on lines is resting dormant. . . . ¶Senate judiciary committee soon to report on tidelands bill. . . .

SUPPLY—Discussions continuing between top Navy Department officials and representative refiners. . . . Navy facing second quarter shortage of 140,000 bbl. per day special fuel oil, and 9,000 bbl. per day of diesel. . . . ¶Stocks of all petroleum, except crude, continue downward trend. . . . ¶Unexpectedly high second-quarter demand, both by military services and civilians, caused Bureau of Mines error in forecasting March crude requirements. . . . Unchanged demand probable for April, May and June. . . . ¶Pressure applied to Texas Railroad Commission for restoration of February allowables. . . . ¶Navy virtually demanding more fuel oil from District 3 (chiefly Gulf Coast). . . .

PRODUCTION—National output dips to lowest level since last October. . . . Decline of 320,160 bbl. in daily crude production reflects allowable cuts in Texas, Oklahoma, and Kansas. . . . Texas alone dropped 291,800 bbl. last week; Kansas was down 12,400, and Oklahoma was off 7,900. . . . California's decline of 11,900 bbl. only unintentional dip in production. . . .

INTERNATIONAL—Ralph K. Davies ridicules idea that Anglo-American oil agreement will be abandoned. . . . Sharp blows aimed at "none-too-scrupulous campaign" to discredit and misinterpret agreement. . . . Delays in Senate hearings admittedly diminishing prospects for Senate ratification. . . . Opponents are well organized. . . . Without PAW and PIWC, proponents are heterogeneous group, lacking leadership. . . . ¶Jersey company confirms reports of damage to Hungarian oil properties now operated by Russia. . . . Budapest dispatches mention $25,000,000 as damage incurred so far. . . . Jersey doesn't say how much but is keeping State Department informed. . . .



These basic statistics furnished one of the chief arguments this week in continuing the oil industry's fight for substantially greater relief in OPA ceilings or in complete abolishment of price control over crude and petroleum products. Price index numbers at left, considering 1926 as parity, show petroleum prices floundering at 1930 and 1937 levels while wages, lumber, coal and the all-commodity curve have risen steeply during and since the war

Unexpected Occurrences Caused Bureau Error in Crude Forecast

WASHINGTON.—A series of unexpected occurrences coincided to cause the Bureau of Mines to guess wrong in its preliminary estimate of crude oil demand for March.

Its official forecast, issued last week, estimates the demand at 4,450,000 bbl. per day. This is some 120,000 bbl. higher than the preliminary guess given to the Texas Railroad Commission the middle of February.

What happened was that for some time the Buerau had been adhering to various trends and estimates which indicated that the crude demand would decline considerably during the first quarter of 1946, and it wasn't until the end of February that facts became available to show that these were all wrong.

Last fall the Petroleum Administration for War and the Petroleum Industry War Council both estimated that the demand for motor gasoline would be low this winter and spring. Refinery runs have been higher than these estimates during recent months, but the bureau figured this was mostly to make up for inventory losses caused by the refinery strikes of last fall. It seemed logical that as soon as these inventories were built up the demand for crude would fall down to the level of the earlier estimates. Also, a few weeks ago it appeared that all available gasoline storage capacity would be full so that refineries would be forced to curtail their runs.

Nature of Occurrences

But several unexpected things happened. In the first place, gasoline consumption, both civilian and military, has been higher this winter than the early forecasts, and in February, much to everyone's surprise, the daily average consumption was 12 or 13 per cent higher than January. One guess is that returning service men, former war plant employes, and strikers have been spending their time making motor trips. Civilian cars and tires seem to be holding up better than some people feared.

Fuel oil demand is also some 5 per cent higher than had been anticipated, but this also wasn't a confirmed fact until definite figures became available late in February. Much of this demand has come from the Navy, which took on the unscheduled job of returning service men via war vessels.

Then, too, probably as a result of OPA price adjustments, refinery yields were changed sharply. It had been estimated that refinery production would be 41 per cent gasoline during the first quarter, but it is now apparent that the January yield was 40 per cent and the February yield between 37 and 38 per cent. This change in yield, plus higher consumption, kept gasoline storage from filling up and thus removed the physical limitation which had been expected to force a reduction in refinery use of crude.

The Texas commission always wants a preliminary estimate of demand by the middle of the preceding month, some 2 weeks before the Bureau of Mines feels ready to make an accurate forecast. It so happened that in recent months the Texas commission has disregarded the bureau's estimate and has based its own allowables on a considerably higher total production from Texas. This time, however, the commission cut allowables to the bureau's preliminary—and erroneous—guess.

When the bureau's final estimate came out, practically all of the additional 120,000 bbl. per day were allocated to Texas, since production in most other states is relatively static.

As for the future, the bureau's prognosticators now feel that product demand during the second quarter will exceed PAW and PIWC estimates by at least as much as during the first quarter. Also, they note a tendency to produce crude in excess of demand, thus increasing stocks of crude above ground. They are therefore guessing that production will hover close to the March level for several months.

FPC Gas Inquiry Shifts To Charleston April 2

WASHINGTON. — Interest in the Federal Power Commission's current omnibus investigation of the natural gas industry shifted to Charleston, W. Va.—heart of the coal producing country—after conclusion of the 15-day consumer hearing in Chicago.

The commission has labeled its inquiry a fact-finding investigation. Five hearings were first held in the gas producing states of the Southwest. This was followed by the session in Chicago. Next comes the Charleston hearing which will open April 2.

Some belief exists that all parties involved in the investigation, government officials, natural gas representatives and coal and railroad interests, are holding back some of their heaviest ammunition for the final hearing which will be held in Washington following the Charleston session.

The last day of the hearing in Chicago brought nine more witnesses, mostly industrial engineers and executives from companies in Colorado and Iowa, reiterating previous testimony that they prefer natural gas, and oppose any extension of federal controls.

In reply to a question of George D. Horning, Jr., representing the National Coal Association, Howard Bruce, mayor of Mason City, Iowa, asserted that the country is now overburdened with federal controls and that any more controls, in his opinion, would not be in the public interest. Other testimony appeared to be directed toward determination of what constitutes the "highest use" of natural gas in the event its supply is decreed to be limited and federal regulation of end use is authorized.

Imports Reach New High; Hardey Asks Protection

The Government's release of oil import figures for the first time since before the war discloses that the volume of foreign oil which entered the United States in 1945 was the greatest in 16 years.

Mounting oil imports have been a subject of alarm to many American oil men, particularly the independents. The 1945 import figures brought a statement from B. A. Hardey, president of the Independent Petroleum Association of America, calling on Congress to protect the country from being "glutted with cheap foreign oil."

Crude imports in 1945 totaled 73,404,500 bbl., according to a Bureau of Mines report. This actually represents only little more than 15 days current United States production.

December crude imports totaled 7,517,500 bbl. The daily figure during December was 4,000 bbl. below November but 112,000 bbl. above December 1944.

"Cheap foreign oil," Hardey said at a meeting of the North Texas Oil and Gas Association, "benefits only a few importers, will not benefit the consuming public and will put thousands of crude oil producers out of business and seriously stagnate the entire petroleum industry in this country."

From January through November 1945, daily average imports of crude and refined products was 307,592 bbl.; of crude alone, 199,362 bbl. Daily averages for 1944, on the basis of the same period, were 254,437 bbl. for crude and refined products; 122,089 bbl. for crude alone.

INTERNATIONAL

Iranian Production Setting New Record

NEW YORK.—Iran's crude production for the period of January 1 to October 31, 1945, totaled 13,621,576 tons (approximately 95,421,032 bbl.), compared with 13,274,243 tons (approximately 92,919,701 bbl.) for the entire year of 1944, according to reports from the Anglo-Iranian Oil Co.

Production in Iran, just before the war was 9,583,285 tons (approximately 67,082,995 bbl.) for the entire year of 1939. In 1940, production dropped to 8,626,639 tons (approximately 60,386,473 bbl.) and in 1941 another drop to 6,605,320 tons (approximately 46,237,240 bbl.) was reported. However, in 1942 and 1943 production started a climb to 9,399,231 tons (approximately 65,794,617 bbl.) and 9,705,769 tons (approximately 67,940,383 bbl.) respectively.

Production of crude from Anglo-Iranian's oilfields in the United Kingdom from January 1 to November 30, 1945, was 66,163 tons (approximately 463,141 bbl.) compared with 94,570 tons (approximately 641,990 bbl.) for the entire year of 1944.

Production in the United Kingdom, by Anglo-Iranian, just before the war was only 3,145 tons (approximately 22,015 bbl.), for the entire year of 1939, but end-of-the-year figures for the next 4 years showed the following results:

Year	Tons	Approx. Bbl.
1940	16,689	116,823
1941	29,992	209,944
1942	81,298	569,086
1943	112,760	789,320

The bulk of Iran's crude comes from two fields, Haft Kel and Masjid-i-Sulaiman, which jointly have produced over one billion barrels from wells which are still producing by natural flow.

Colombian Oil Interests Given Export Freedom

BOGOTA.—One obstacle to future Colombian oil development seems to have been cleared by a Presidential ruling that oil interests will no longer be required to retain the proceeds of their exports within the country.

The ruling also held that oil interests will not be required to seek a permit to export oil. However, when Colombia's international trade balance requires it, the government may ask that 25 per cent of such taxfree proceeds be returned to the country. Only company affected is Cia. Colombiana de Petroleo El Condor, a Shell affiliate, since the De Mares and Barco grants operate under special contracts. Colombia's oil industry has been importing capital of greater value than the oil exports, but experts point out that this situation obviously can be continued only during the exploratory period.

Trinidad Leaseholds Output Drops From High War Level

NEW YORK. — Oil Production by Trinidad Leaseholds (N.Y.), Inc., from its own fields in January had dropped more than 2,400 bbl. from its high wartime level of a year ago.

Production figures from the corporation follow: Year ending June 30, 1945, 7,181,860 bbl., daily average, 19,676 bbl.; 2 months ending August 31, 1,181,876 bbl., daily average, 19,062 bbl.; September 578,890 bbl., daily average, 19,296 bbl.; October, 588,814 bbl., daily average, 18,994 bbl.; November, 556,010 bbl., daily average, 18,534 bbl.; December, 554,973 bbl., daily average, 17,902 bbl., and January, 534,354 bbl., daily average, 17,237 bbl.

Company Plans to Resume Drilling in Philippines

WASHINGTON.—Halted at the outbreak of the war, oil exploration in the Philippine Islands is to be resumed in about 6 months by Far East Oil Development Co.

In 1941, the company has drilled to 8,330 ft. in northern Cebu with encouraging indications. The program will be resumed as soon as necessary equipment can be obtained to take the place of that destroyed early in 1942 in the face of the Japanese invasion.

Swedish Monopoly Reported Seeking Latin American Oil

LONDON. — Fearing that United States interests may not be willing to supply its new state oil monopoly, Sweden is reported seeking alternative oil sources in Latin America.

A source here said that Swedish officials had approached Venezuela and Ecuador but failed to receive encouragement. Mexico also was sounded out, and there was no indication as to what this country would do. Last year a Mexican trade mission in Sweden laid the groundwork for a commercial treaty which presumably would include oil purchases.

Sweden is interested chiefly in buying crude since she plans to do her own refining. United States interests, the informant here said, look with disfavor on the country's efforts to buy oil in Latin America but there was no evidence of interference with the proposals to Venezuela or Ecuador. The opposition of United States companies to the new Swedish agency is said to be based on a belief that "monopoly countries are spot buyers of cargo lots, or a precarious business which does not represent a continuing interest."

Bolivia Completes Plans For 100-Octane Refinery

LA PAZ. — The Bolivian government is entering the 100-octane field with plans now complete for a refinery which is expected to be located at Cochabamba.

With rising oil production and increasing shipments to Argentina, the semistate petroleum organization, YPFB, is preparing to spend about $12,000,000 for the 100-octane plant and for a 168-mile 6-in. pipe line with a 500 bbl. daily capacity from Camiri to Sucre. The Camiri refinery for production of 72-octane gasoline is reported finished.

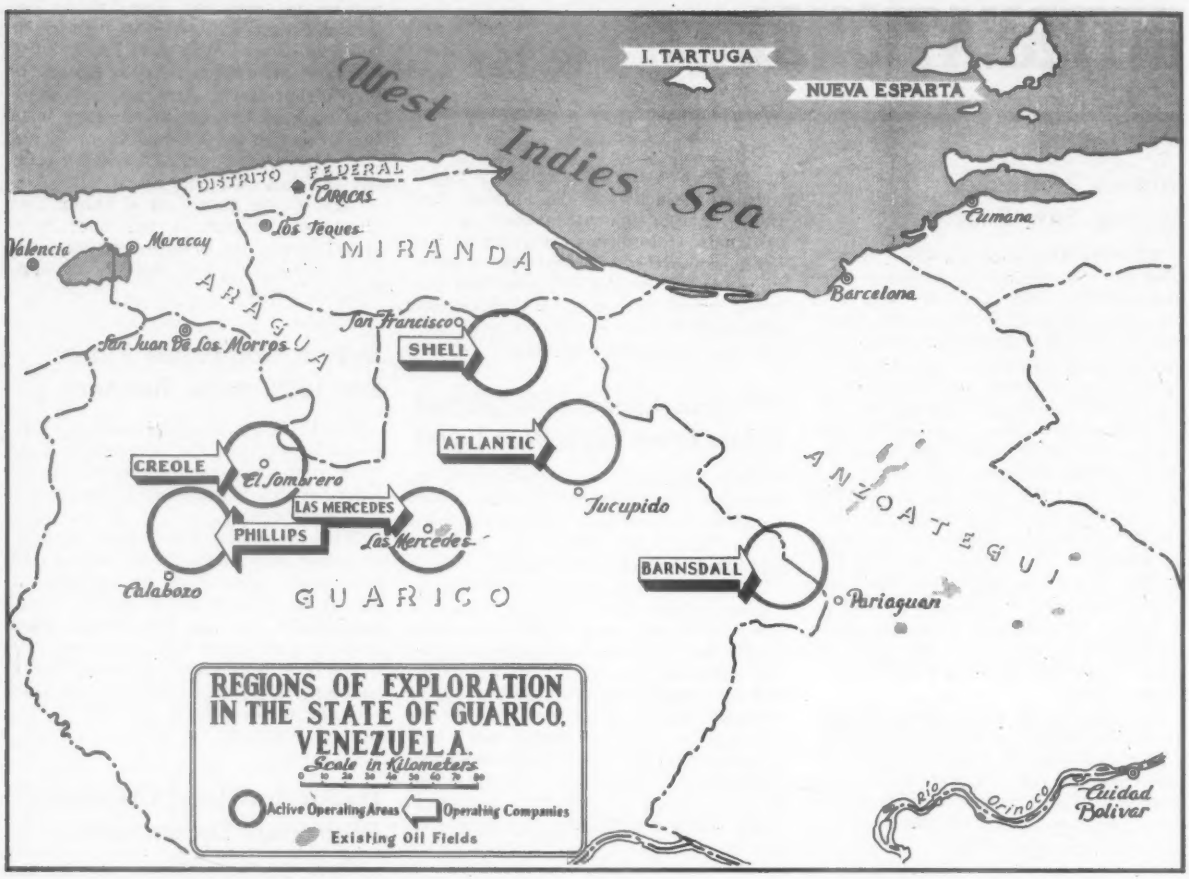
Hungarian Loss Discussed With State Department

NEW YORK. — While no formal claims have been filed, Standard Oil Co. (N. J.) representatives have discussed with officials of the State Department reported damage to producing properties owned by an affiliate in Hungary.

Eugene Holman, New Jersey Standard president, said information from Budapest indicated formal statements have been filed with the United States legation there regarding operation of the fields by the Russians but no information was available on the amount of the damages. Standard's representatives were reported to have been barred 2 months ago from properties of the Hungarian affiliate in the Lispe field, and recent dispatches tell of damage to American property from Russian flush production methods approximating $25,000,000.

Tanker Rate Reduced

WASHINGTON.—United States exports of petroleum and its products to France has been given a boost through a 30-cent a ton reduction in tanker rates. The War Shipping Administration ordered the voyage charter rate to French ports lowered from $7.95 to $7.65 a long ton. The new rate is in line with the basic rates to the United Kingdom and eastern Europe.



Areas of camps and initial operations of oil companies which are now under way

Guarico's 1946 Exploration Program Is Most Extensive in Venezuela

by Paul Reed

THE exploration program for 1946 in the state of Guarico is the most important in Venezuela and is generally regarded as among the most extensive undertakings in the world to discover new reserves.

The venture to explore Guarico entails large expenditures in a gamble by the industry to determine whether prolific producing areas of the states of Anzoategui and Monagas extend westward into the state of Guarico. According to the Venezuelan Government reserves of the Eastern Venezuela region in which Anzoategui and Monagas have the principal producing fields have been estimated to be 1,500,000,000 bbl. Through the wildcat drilling program getting under way this year the industry will determine whether great thickness of oil producing marine sediments to the eastward will be found also in Guarico.

This is the first of several articles by the author, who is pipe-line editor and staff engineering writer of the Journal. Reed has been in South America since the first of the year, visiting the main operating camps and with key engineers in charge of Latin-American activities. In this report he explains the producing, drilling, and exploratory practices employed in the Las Mercedes area, State of Guarico, Venezuela.

Although parts of Guarico may be reached by existing circuitous roads, large sections of this extensive state located south of Caracas will present difficult transportation problems for drilling operations until roads are available which are a part of programs now being pushed by the oil companies. Plans involve many miles of main highway and lateral roads in the Puerto la Cruz-El Sombrero system which is discussed in a subsequent article.

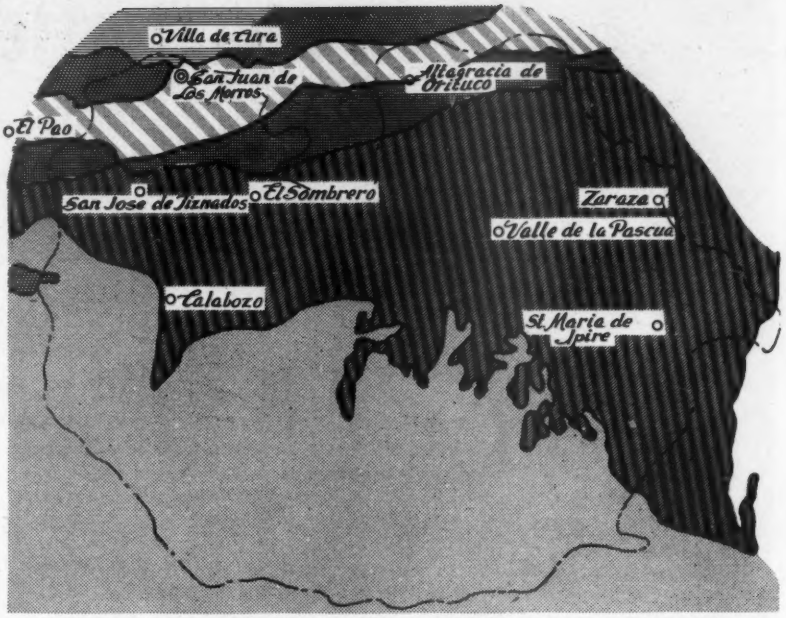
Because of the terms of the exploration concessions, wildcatting is being accelerated in Guarico and the adjacent vicinity. Incidentally, it should be noted that more than half

of all the exploration concessions in Eastern Venezuela are located in Guarico.

In the period when the present Guarico concessions were acquired, all of the companies were "concession hungry." This was because the 1938 petroleum law had been so onerous that concession activity was nil until the 1943 law became effective.

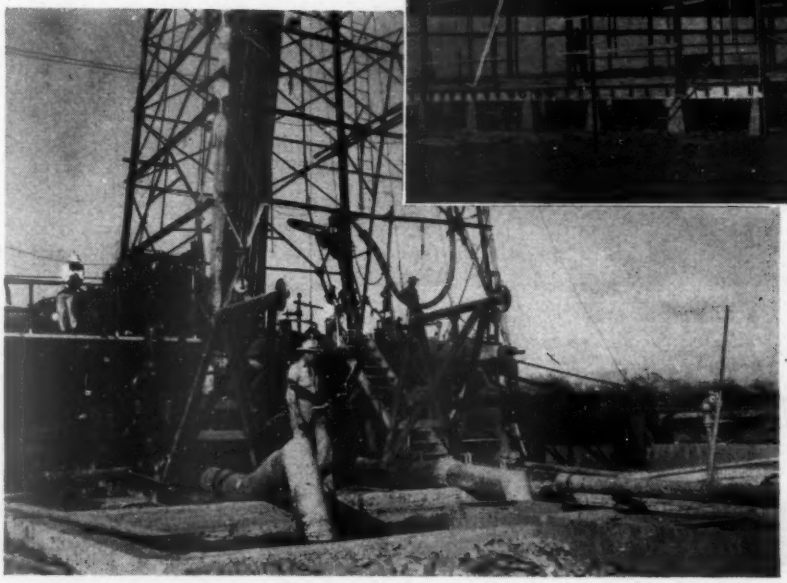
Concessions were acquired at high costs in Guarico by a larger number of companies than participate in the acquisition of concessions in other Venezuelan states which have not yet established themselves as regular producing areas. For exploration concessions in Guarico, the initial bonuses range from a minimum of 2 bolivars (60 cents) to a maximum of 40 bolivars ($12.00) per hectare (2.47 acres). When concessions are converted from exploration to exploitation status, the minimum terms call for payment of 18 bolivars ($5.40) per hectare and 16⅔ per cent royalty; maximum terms are of three kinds for different deals: bonus of 100 bolivars with 20 per cent royalty; 200 bolivars with 18 per cent royalty, and 250 bolivars with 16⅔ per cent royalty. In acquiring national reserve and exploration concessions, bonuses have been paid from 30 to 200 bolivars with royalties from 19 1/6 to 21⅔ per cent.

Drilling to the Cretaceous in earlier wildcatting along the "tar shelf" has led to renouncing some concessions to the southeast. A significant test in Guarico exploration was Las Allas drilled by joint interests southeast of Zaraza.



Geological sketch of the State of Guarico from Dr. Kamen Kaye's "Esbozo Geologico del Estado Guarico"

Below: Steam rig of Las Mercedes company with concrete mud pit and type of suction hoists fabricated at the field camp shop. Right: Warehouse in process of construction for permanent camp for Las Mercedes operations



In preparation for future exploration and development in Guarico, work is being done and planned entailing large expenditures in the next 2 years. Some of the company budgets for roads and temporary and permanent camps total considerably more than $10,000,000. Oil company programs definitely call for operating a total of 16 to 18 rigs. Seven rigs will be those of S. A. Petrolera Las Mercedes, four rigs of Creole Petroleum Corp. for 6,000-ft. tests, one rig of Phillips Venezuelan Oil Co., and possibly another later; one rig of Barnsdall South American Corp. for

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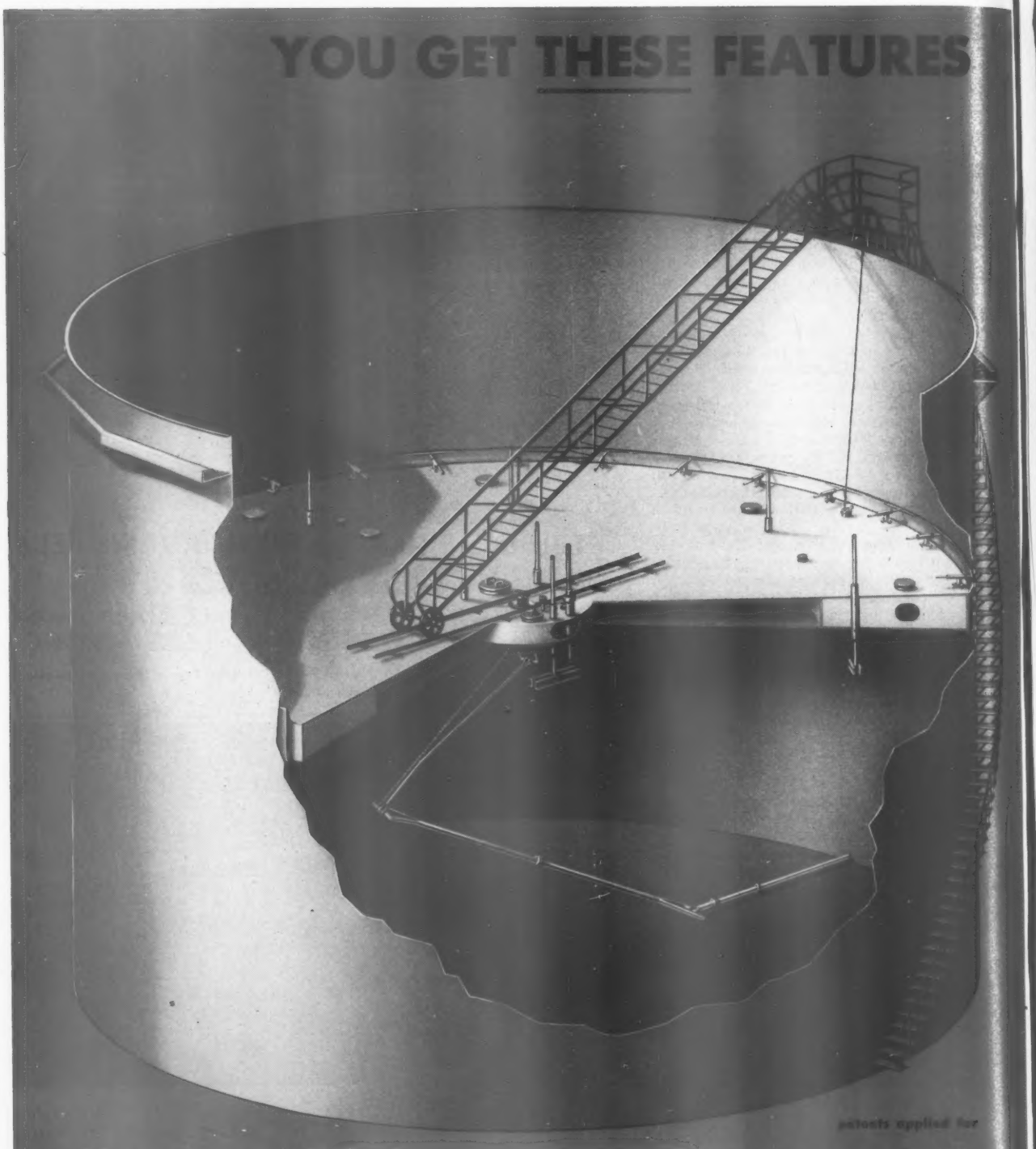
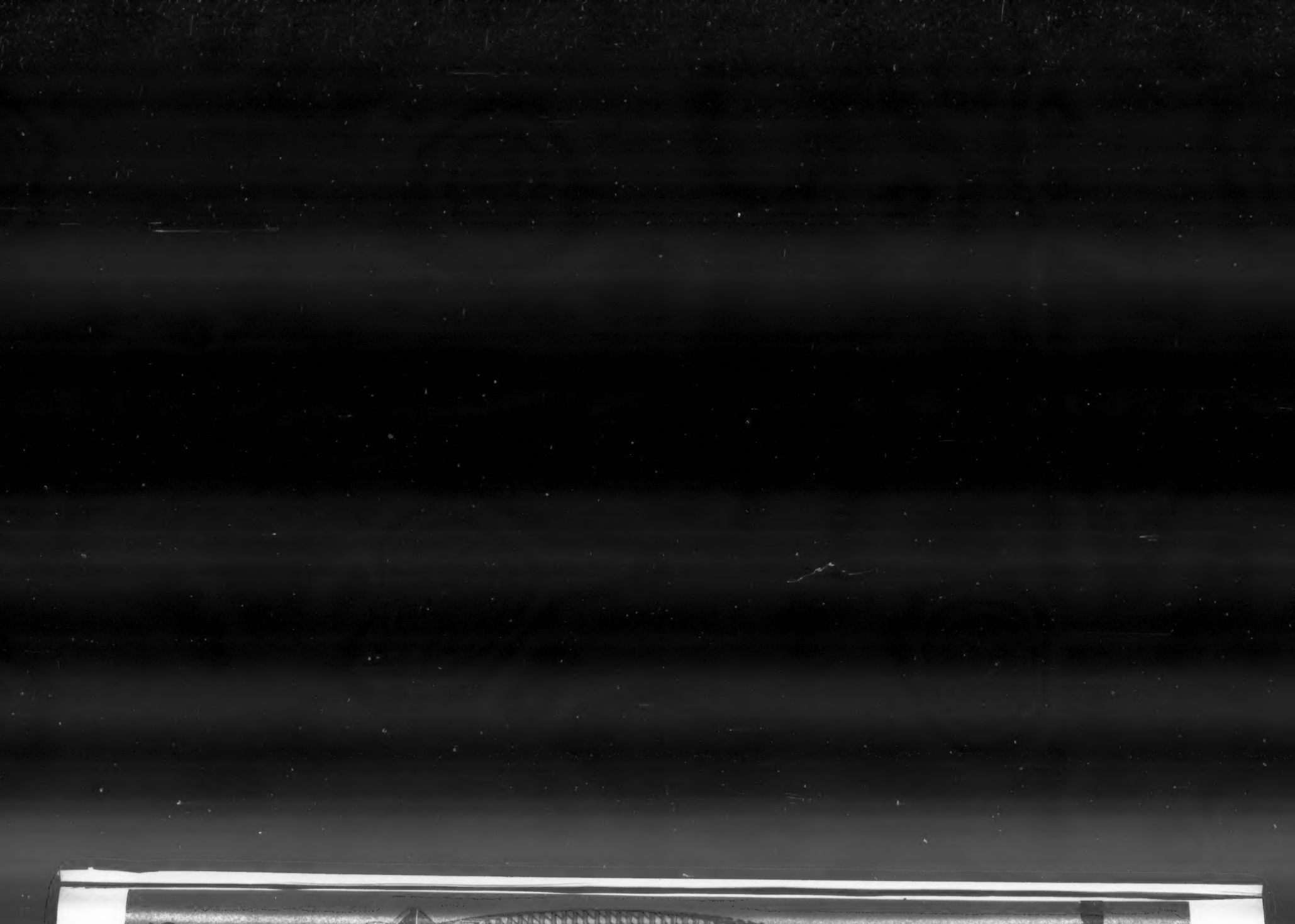
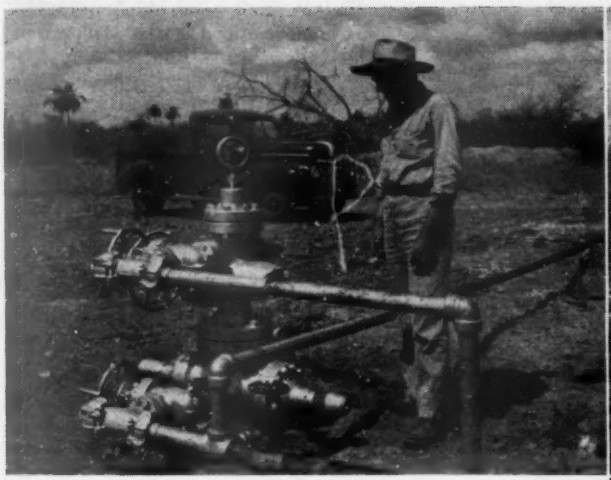
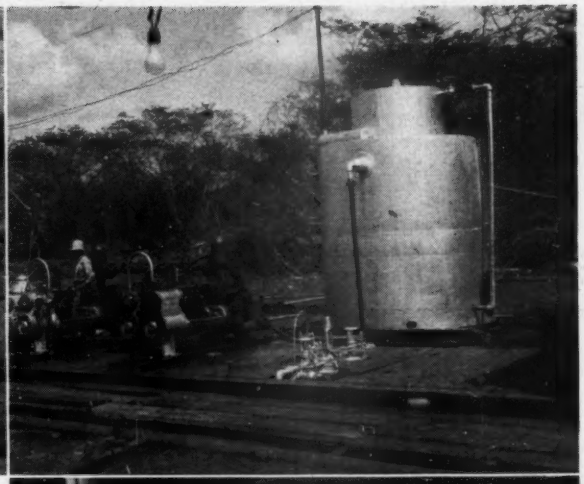


patents applied for

● *This cut-away view shows some of the construction features of the Horton Floating Roof. It effectively reduces evaporation losses from volatile products stored in flat-bottom tanks. Installation can be made on new tanks or existing tanks whose shells are in good condition.*







Above, left: Well No. 8 of S. A. Petrolera Las Mercedes dually completed in Miocene and Cretaceous sands in the Las Mercedes field in Guarico. This is the only Cretaceous producing well in Eastern Venezuela. Above, right: Boiler feed pumps and preheater of Las Mercedes company. Right: Machine shop at temporary field camp of Las Mercedes company

a 6,000-ft. test, two rigs for carrying out the plans of the Shell group, and a rig for a 10,000-ft. test of Venezuelan Atlantic Refining Co. with the possibility of another rig being added later.

In addition to the concessions of the companies just mentioned, other exploration concessions are held in Guarico and adjoining areas by Sinclair Oil Co. and Caracas Petroleum S. A. Of the total of 2,006,592 hectares (4,956,282 acres) granted in Guarico and the immediately adjoining area under the 1943 law, 1,032,550 hectares (2,550,398 acres) represent exploration concessions. Only 6,000 hectares (14,820 acres) of existing concessions in Guarico were granted under the laws prior to 1943.

Provisions of Law

By the terms of the exploration concessions of the 1943 law, it will be to the advantage of operators to wildcat extensively in 1946 and 1947 in order to obtain data to aid in determining what areas will be most favorable to retain. Half of each 10,000-hectare (24,700 acres) exploration concession must be returned to the Venezuelan Government. Areas retained by the oil companies may be held in 500-hectare parcels (1,235 acres) when the conversion is made from exploration to exploitation status.

Up to now the most aggressive wildcatting and development work in Guarico has been done by S. A. Petrolera Las Mercedes. This company whose operations are directed by W. I. Woodson, president and manager, at Caracas, is owned 50-50 by Texas Petroleum Co., the operating organization, and Caracas Petroleum Co. In Guarico the two companies have a total of 656,762 hectares (1,622,202 acres) of which Las Mercedes has 179,000 hectares (exploration) and 348,000 hectares (exploitation); the Caracas company has 109,850 hectares (exploration) and 29,912 (exploitation).

In completing a total of 23 wells, Las Mercedes company has 20 producers and 3 dry holes in an area known as the Las Mercedes field near the town of the same name, somewhat north of the center of the State of Guarico. In addition the company has drilled three dry wildcats on acreage to the south of the field. The field follows the length of the structure. The proven area there is 13 kilometers (7 miles) long and about 6½ kilometers wide at the widest part. The size of this pool, the wide 80-acre spacing and average potential production of 300 bbl. per well of oil with average gravity of 32° A.P.I. and well-head pressures between 600 and 700 lb. indicate the existence of substantial reserves. Before the Las Mercedes development, two dry holes had been drilled in the area by Guarico Oil Fields, Ltd.

Since gas is found in the upper part of the structure, the program of the Las Mercedes company is to aim for oil on flanks. Sands are lenticular in character and highly faulted. The principal producing zone has between 30 and 40 ft. of hard sand.

Production comes from three sand zones in the La Pascua (Miocene) formation found between 4,000 ft. and 4,400 ft. One well, No. 8, has been dually completed in a La Pascua sand and in a Cretaceous sand found at a structurally high location at a depth of 5,100 ft.; the Cretaceous oil has been reported as of 26° A.P.I. gravity. Although this is regarded as a small producer it is notable as the first and only cretaceous oil well in Eastern Venezuela. The company expects to drill several of this year's wells to the Cretaceous. The Tertiary section penetrated in development operations is said to have no relation to any other Tertiary section in Eastern Venezuelan oil fields.

Since there is now no pipe line in the State of Guarico or any other commercially practicable means of transportation to provide an outlet, Las Mercedes wells are shut in except for gas production to furnish fuel to the company's drilling rigs. Before a pipe line can be built it will be first necessary to complete a large part of the pilot road now under construction between Puerto la Cruz and El Sombrero. Las Mercedes company has purchased a port site for a marine terminal at the first bay east of Guanta in the general vicinity of Puerto la Cruz.

The company has been developing

Expatriate living quarters for permanent camp of Las Mercedes

the Las Mercedes field with steam rigs. Water is not available from streams as in many fields in Eastern Venezuela but must be procured from water sands at 350 to 500 ft. through perforated casing in plugged back dry holes or through wells specially drilled for that purpose.

For developing the field itself Las Mercedes company has been using three steam rigs; another steam rig is being shipped to provide a total of four. The wildcatting by the company in Guarico is being done with two diesel rigs; one more will be added. Thus, the company will have a total of seven rigs for its 1946 program, calling for a total of 34 wells including five wildcats which will be drilled at an average rate of approximately one and one-half wells per month. Wildcatting is being done in the Punzon-Grico area west of the "Chain lots" of Las Mercedes field and at the Comaz-Placer area northwest of the field.

Usual Drilling Practice

The usual drilling practice in Las Mercedes field is to start a 13¾-in. hole, plus or minus 1,000 ft. of 10¾-in. casing with 350 sacks of cement and drill 9¾-in. hole to approximately 4,500 ft. and set 7-in. pipe through the sands with 250 sacks of cement. After gun-perforating and completing as a producer 2½-in. tubing is run.

Formations encountered in drilling consist of approximately 1,800 ft. of clay followed by 2,700 ft. of Roblecito shale having thin streaks of Roblecito sand from which one Las Mercedes well, No. 13, produces gas. The Roblecito shale makes a satisfactory drilling mud. For mud treatment a small amount of sodium tannate is used.

While the bottom-hole temperatures of approximately 190° F. are higher than the average for similar depths in other Eastern Venezuelan fields they are not sufficient to react on chemical treatment or mud pump operation.

Steam rigs used by the company have three 125-hp. boilers with large feed-water preheaters. The diesel rig has three 225-hp. engines.

The Las Mercedes company has been operating from a large temporary camp with the facilities necessary for conducting such wildcat operations in Venezuela. These facilities are built on a scale much larger than those for many permanent camps in the oil fields of the United States. Furthermore, a start has been made toward building an extensive permanent camp. Several structures are either completed or in various stages of construction.

Plans for the camp provide for 3 bachelor houses and 23 family houses for expatriates; labor quarters for 48 families and 18 duplex houses. Camp facilities will include an office building, club house, hospital, general warehouse and parts warehouse, garage, school for Venezuelan children, welding shop, machine shop with three lathes, drill press, milling machine and power saw, and a power plant with two 250-hp. generators.

Accomplishments of the Las Mercedes company in pioneering the discovery and development of this oil field under the difficult war conditions of supply and transportation promise to be of much significance in the progress of events in Guarico for which major companies of the industry are planning extensive operations.

Most of the State of Guarico is an arid plains country which is sparsely settled. At its northern extremities it touches the mountainous region extending along the Caribbean Coast. Men and supplies are now usually brought into the El Sombrero and Las Mercedes areas by winding roads over the mountains from Puerto Cabello and Caracas. By a round-about route it is possible to follow this road across central Guarico to Barcelona and Puerto la Cruz, ports of entry through which eastern parts of Guarico may be reached. It is so difficult in the rainy season to reach Venezuelan Atlantic Refining Co.'s operations in the vicinity of Tucupido that 1,000 tons of supplies are now being shipped to the exploration camp site during the present dry season to last for several months. In fact the camp will be entirely isolated during the wet season.

Creole Petroleum Corp. is constructing a large camp with ample provisions at El Sombrero for offices, living quarters, hospital, repair shop, warehouses, etc., for the exploration operations now being conducted from that point. Creole's second well was spudded in February in the vicinity of El Sombrero.

For Shell operations a camp is now being built near San Francisco close to the northern border of Guarico.

Barnsdall South American Corp. spudded in February at its first Guarico test near its camp at Paruaguan.

Phillips Venezuelan Oil Co. plans a camp between Calabozo and El Sombrero.

Located Over Geosyncline

The State of Guarico is located over a part of Venezuela's largest geosyncline which is filled with Cretaceous and Tertiary sediments. A brief outline of the principal geological features of Guarico is given below from information contained in "Esbozo Geologico del Estado Guarico" by Dr. Kamen Kaye, Caracas Petroleum S.A., published in Revista de Fomento, No. 49. According to this paper, the geological history of Guarico is that of this geosyncline. Briefly it may be said that this geosyncline represents a series of basins of deposition which advanced toward the south during Tertiary and Quaternary.

Although it is hard to give an idea of the configuration of the land and sea during Cretaceous time, it may be regarded as having advanced considerably to the south across the state. With a few interruptions, marine sedimentation continued in the Paleocene and lower Eocene. In the Middle Eocene, sedimentation may have been reduced and even interrupted. It is possible to presume that important land barriers existed along the north axis of Guarico in this period. The formation of these barriers was accompanied by igneous intrusions. A new invasion of comparatively restricted seas occurred in the Upper Eocene, but in spite of the limiting conditions it was truly marine in nature.

Conditions of sedimentation were similar during a long geologic time, at least in the north of Guarico where there is evidence of outcropping of sediments which embrace the Middle Cretaceous and the Upper Eocene. These conditions were favorable for the deposition of large amounts of dark gray clay, conveniently described by Kaye by the term, "Facies de arcillas oscuras."

With the arrival of the Oligocene

there came a marked change in sedimentation, under saline-estuary conditions in a basin to the south and in the basins previously mentioned. Several marine invasions occurred during this epoch but they were not comparable in extent with those represented by the "Facies de las arcillas oscuras" of the previous epochs. These new conditions persisted through all of the Oligocene and undoubtedly continued into the Lower Miocene, forming a section called by Kaye, "The group of Guarumen sands."

Geological Changes

During the Middle Miocene, or possibly later, conditions of sedimentation commenced to change gradually. At the end of the Miocene and the beginning of the Pliocene, the change was most marked. There was mainly a retreat of the seas, deposition of lignites and in some places invasions of the sea. Occasionally in these marine invasions there were depositions of exceedingly fossiliferous beds resembling those of the Zaraza region. During the Quaternary, the sea retreated completely from the geosyncline. in this last epoch there were lakes or an ancestral form of the Orinoco River. In recent times it may be assumed that the southern boundary of these land masses has been eroded by the action of the Orinoco River.

A stratigraphic description of Guarico may be briefly given as follows: (1) Facies de arcillas oscuras (facies of dark clays), Cretaceous and Upper Eocene; (2) Group of Guarumen sands, Oligocene-Upper Miocene; (3) Spotted shales, calcareous sandstone, mio-Pliocene; (4) Plateaus, gravels, Quaternary; (5) Terraces and alluvial deposits of the Orinoco, recent.

What has been learned from geologic studies and geophysical exploration has impelled the oil industry to undertake the costly drilling programs which are characteristic of South America where auxiliary expenses for camps, roads, etc., frequently amount to eight or nine times the actual expenditures for drilling. While exploration expenses are on a greater scale than those in the United States, the stakes to be won are greater, for sands are, on the whole, thicker and more productive. Instead of aiming at fields with reserves of 25,000,000 bbl., in Venezuela experience has encouraged the search for fields which may be found to have reserves of 100,000,000 to 200,000,000 bbl. The drilling activity in Guarico in 1946 and 1947 has for its objective reserves of great magnitude.

Anderson-Prichard Oil Corp. Undergoes Reorganization

OKLAHOMA CITY.—In a financial reorganization of Anderson-Prichard Oil Corp., J. Steve Anderson, Sr., vice president and one of the founders, has relinquished his interest in the company.

Sale of all stock of Anderson was followed by the resignation of P. H. Anderson, vice president and treasurer, and J. Steve Anderson, Jr., service agent for the company. L. H. Prichard, Sr., president, also sold a a portion of his interest, retaining 32 per cent of the total stock issue.

Two issues of stock to be sold already is reported oversubscribed. Through a group of underwriters, the company is offering 80,000 shares of $50 par preferred stock at $51.75 a share, and 425,000 shares of $10 par common stock at $19 a share. The offering of common will place 68 per cent of this hitherto privately owned stock in public hands.

Besides Prichard as president, new officers will include as vice presidents T. H. Marshall, director, treasurer, and finance officer; L. H. Prichard, Jr., director; Dr. R. W. Brauchli, in charge of the land and geological department; George H. Burruss, in charge of refining; C. H. Dresser and C. L. Mayhall, marketing, and Weston Payne, in charge of crude oil purchasing.

Scientist Expects Oil to Benefit by Atomic Study

NEW YORK.—Speaking of the by-products of the atomic bomb research, Dr. L. C. Beard, Jr., assistant director, Socony-Vacuum Laboratories, said, in a radio interview here March 5, that fundamental knowledge, techniques and instrumentation will find quicker and more useful application than nuclear energy itself.

Answering the question, "What are some of these byproducts that you visualize?" Beard said:

"For example, in the petroleum industry, extensive use is made of the mass spectrograph for analyzing and controlling the gas feed streams to the units making aviation gasoline. Improvement and extensions of the use of instruments of this nature will be of value to the petroleum industry. X-rays are used to detect defects in metal petroleum equipment, and increased availability and variety of radio-active materials will accelerate such application. In the production of oil, gamma rays and neutrons are used in radio-active well logging. Here again, greater availability and variety of radio-active substances will facilitate the discovery and recovery of petroleum," he explained, adding: "Isotypes and radio-active elements and their combinations can be used as tracers to explore the mechanism of chemical research."

Synthetic Rubber Ranks as U. S. Industrial Triumph

NEW YORK.—The story of the phenomenal rise of the United States' synthetic rubber industry which started from scratch 5 years ago and now stands as a triumph to American technology is told in figures released by the Rubber Manufacturers Association.

In prewar days economists and military strategists had long listed rubber as one of the nation's most serious raw materials deficiencies. In 1941, the country used 775,000 tons of natural rubber and 108 tons of the general purpose synthetic, GR-S.

When Pearl Harbor was struck, a start had been made on building up a natural-rubber stockpile but it was the synthetic plants that carried the country through the war years. While natural rubber consumption shrunk to 105,406 tons in 1945, GR-S production jumped to 2,579 tons in 1942; 131,977 tons in 1943; 495,552 tons in 1944; and 600,001 tons in 1945. Production of other types showed similar increases. Production in 1945 of GR-M (neoprene) stood at 42,363 tons; and GR-I (butyl) at 43,009 tons.

Quantity production brought sharp drops in costs. Prices prevailing until April 1943 were 50 cents a pound for GR-S, 65 cents a pound for GR-M, and 33 cents a pound for GR-I. By the end of 1945, these prices were 18½ cents, 27½ cents, and 15½ cents respectively.

Jersey Standard Subsidiary Plans Model City in Peru

LIMA, Peru.—Between $10,000,000 and $12,000,000 will be spent in the next 5 years by International Petroleum Co., a subsidiary of Standard Oil Co. (N. J.), in constructing a model industrial city at Talara, port and refining center for International fields in northern Peru.

Reports of plans for the project were confirmed here by R. T. Haslam, New Jersey Standard vice president, in an interview prior to his departure from Lima to continue an inspection tour of company property in South America.

Also confirmed by Haslam was the signing of a contract with the Peruvian Government under which International Petroleum will pay $3,500,000 annually for a 5-year exploration concession covering the Sechura Desert area south of the present producing fields. This contract is subject to approval of the Peruvian Congress.

The International fields, for which the project at Talara will be built, are estimated to have a minimum life of 25 years, according to the New Jersey Standard official.

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AT YOUR SERVICE AT ALL TIMES

Crude Increase, Warmer Weather, Bolster Refinery Gasoline Market

by Dahl M. Duff

GASOLINE markets reacted somewhat favorably this week in the wake of the widely condemned 10-cent a barrel Office of Price Administration crude-oil-price raise.

Though no change in quoted gasoline prices occurred, several marketers expressed belief that the additional crude cost to refiners, coupled with the approach of summer and higher demand, will lift present below-ceiling quotations above present levels.

There appeared to be no rush to buy gasoline in anticipation of higher prices. However, much of the so-called distress gasoline which has been depressing the Mid-Continent market was being priced at 4¾ cents. Low on major quotations varied from 5 to 5¼ cents a gallon for the 73-75 grade in the Group 3 area.

Much interest centered on the situation in residual fuel oil following a meeting in Washington at which Naval officials sought to impress on 32 refining industry representatives the seriousness of the shortage which threatens exhaustion of the Navy's stocks by April 15.

March 2 stock reports showed distillate fuel oil suffered a heavy depletion during the week, declining 1,005,000 bbl. to 38,285,000 bbl., although yield of the product rose from 24.6 to 25.8 per cent.

Predicting a shortage of residual of about 5,000,000 bbl. on the East and Gulf coasts by April 30, the East Coast oil industry advisory committee recommended to the Office of Price Administration a plan to head off the situation.

The committee, headed by A. J. McIntosh, Socony-Vacuum Oil Co., Inc., economist, suggested that a compensation plan be instituted by which claimants can move surpluses from the Mid-Continent area to East Coast points without substantial loss. It also asked that companies with government contracts be allowed to import this surplus and charge the government agency at full out-of-pocket cost. A gravity price scale was recommended by a majority of the committee. A minority group suggested a 15-cent-a-barrel increase to induce necessary production. This was reported favored by OPA.

Besides residual, No. 2 burning oil and kerosene were reported tight as ever in the New York area. Gasoline prices were firmer, but plenty of the product was available at all points.

On the West Coast, shipping officials were concerned over securing adequate supplies of bunker fuel oil and diesel. Pacific Coast inventories were low, and the feeling was general that present ceilings are too low in the light of existing crude prices.

The market in gasoline, however, was encouraged by the March 2 report showing daily gasoline demand in the week reached 2,017,000 bbl., highest since November. Gallonage has failed to take the heavy postwar drop some market analysts expected. Demand in the 5-week period ending March 2 averaged 1,844,000 bbl. daily, a decline of only 2.48 per cent from the corresponding 1945 period.

Gasoline stocks also showed a slight decline of 247,000 bbl. They stood at 104,462,000 bbl. According to The Oil and Gas Journal's survey, crude production was down 320,160 bbl. daily for the week of March 9, reflecting the allowable cuts of Texas, Kansas, and Oklahoma. Crude stocks, for the week ending March 2 were reported by the Bureau of Mines at 229,430,000 bbl., an increase of 2,731,000 bbl.

In Washington, the Office of International Trade said there has been no general halt to products exports and that the recent temporary suspension of export licenses on residuals and diesel has been revoked.

Commissioners Curtail Texas Crude Bonuses

AUSTIN. — The Texas Railroad Commission has taken another step toward reducing the state's production in addition to its order cutting March allowables by 353,000 bbl. daily.

Effective immediately, producers will get no production bonus for the first four wells drilled after the discovery of a new pool or horizon. The discovery well will continue to get its oil bonus for 18 months or until a sixth well is drilled into the formation.

One of the devices used to encourage drilling and production during the war, the bonus plan allowed 20 bbl. additional oil per 1,000 ft. of depth to be taken from the discovery well and the next four producers in the new pool or horizon. Maximum bonus was 200 bbl.

More Crude Subsidy Payments Approved

WASHINGTON. — Stripper well subsidy payments have been authorized by the Office of Price Administration for several additional pools, and increased in others.

Pools affected by the latest announcement and the per barrel amount of the payment are: Texas—Akard 5 cents, Heiner 20 cents, Hoover 35 cents, Pierce Junction 14 cents, Refugio (old) 2 cents, Simpson 35 cents; Kansas — Claussen 35 cents, Potwin 25 cents, and Rickard 20 cents; Arkansas—Lewisville 5 cents; Illinois — Sailor Springs East 20 cents; Louisiana—Bay St. Elaine 2 cents; and Michigan — Beaverton South 20 cents. The new payments increase the total for the Lewisville and Akard pools to 25 cents.

DEATHS

Hugh L. Sawyers, 55, executive secretary of the New Mexico Oil and Gas Association, died March 10 in Roswell.

William C. Wren, 51 general superintendent of Mid-Continent Pipe Line Co., died March 8 in Tulsa. He had been employed by Mid-Continent for 26 years, beginning as a gager. He went to Tulsa 3 years ago from the Osage, Okla., district when he was made general superintendent and assistant to J. Marston Linehan, vice president.

Andrew M. Hazzard, 53, Shell Oil Co., Inc., petroleum engineer in California since 1923, died March 3 in Alhambra, Calif. During the war, he was superintendent of Shell's coastal production division in Ventura.

Henry McSweeney, 91, Pennsylvania oil man who was an organizer of several companies, including British-American Oil Co. and Union Gas Co., died March 5 in Atlantic City. In 1884, he was made solicitor for all pipe lines west of New York which were owned by Standard Oil Co. He later served as a director of Union Gas, British-American Oil, and several Standard Oil companies, and was a partner in Snowden & McSweeney Co., independent producers.

E. C. Kincade, vice president of Gulf Refining Co., died March 5 in Houston. Kincade, who had been associated with Gulf since 1907, was widely known in oil circles throughout the Southwest and in Pennsylvania.

Reed Alsobrook, 57, Midland, Tex., oil operator, died March 3 in Dallas.

Robert Williamson, 54, New England public relations director for Standard Oil Co. (N. J.), died March 2 in Brookline, Mass.

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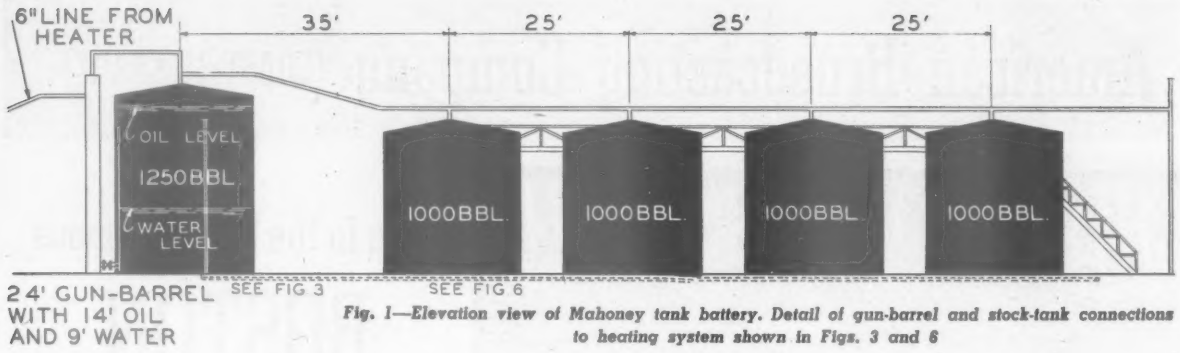


Fig. 1—Elevation view of Mahoney tank battery. Detail of gun-barrel and stock-tank connections to heating system shown in Figs. 3 and 6

Waste Hot Gun-Barrel Water Utilized To Heat Tank Bottoms

by Neil Williams

Practices adopted by Sinclair Wyoming Oil Co. for conservation of heat required in treating crude oil in Wyoming fields and for utilizing the formerly wasted heat of the hot gun-barrel water for cleaning tank bottoms and running the oil are described. By these practices, substantial economies are being realized in fuel consumption and equipment installed.

SINCLAIR WYOMING OIL CO. since last summer has carried out a program calling for the insulation of gun barrels, heaters, and connecting hot-oil lines at lease batteries in the various Wyoming fields in which it operates. Also new, and now in operation at two batteries, one at Salt Creek and the other in the Mahoney field, is a system whereby the hot water siphoned from the gun barrel can be utilized, instead of steam, as the heating medium for tank bottoms and congealed oil.

Although these innovations are especially advantageous under the cold-weather and production conditions existing in these and other fields in that part of the country, it is possible that they could be applied at tank-battery installations in most any field where heating is required to break emulsions and handle the congealed oil.

Insulation applied consists of 1¼-in. magnesia blocks shaped to the equipment and then wrapped with an insulating covering and coated. Since this is the first winter in which the batteries have been operated with insulation, data as to the specific savings realized as compared with the costs of operation without this protection are not yet available. However, it has been noted that fuel requirements for heating the oil have been greatly reduced and more effective temperature conditions for oil treating have prevailed.

Prior to insulating, ability to maintain adequate temperature of the oil in the gun barrel was dependent largely upon the atmospheric temperature, wind, and other elements. During periods of extremely cold weather or when winds were high, it often was difficult to attain the desired oil temperature in the gun barrel without excessive firing of the heater, or to hold a uniform temperature without constantly varying the firing control. Under such circumstances it usually was necessary to fire the heater continuously at temperatures of as much as 145° F. to 165° F. and still not maintain a temperature of more than 80° F. to 85° F. in the gun barrel. This represented drops of from 60° to 85° in the temperature of the oil from the heater to the gun barrel.

Since insulating this equipment it has been possible to reduce firing temperatures in the heaters to around 125° F. to 130° F. and at the same time maintain a temperature of from 110° F. to 115° F. in the gun barrels. This is a drop of only 10° to 20° in the temperature between the heaters and gun barrels, as compared to the 60° to 85° drop resulting without in-

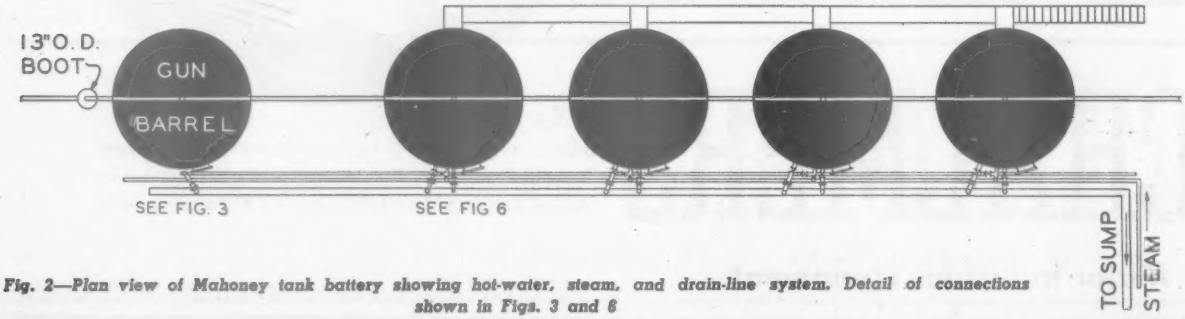
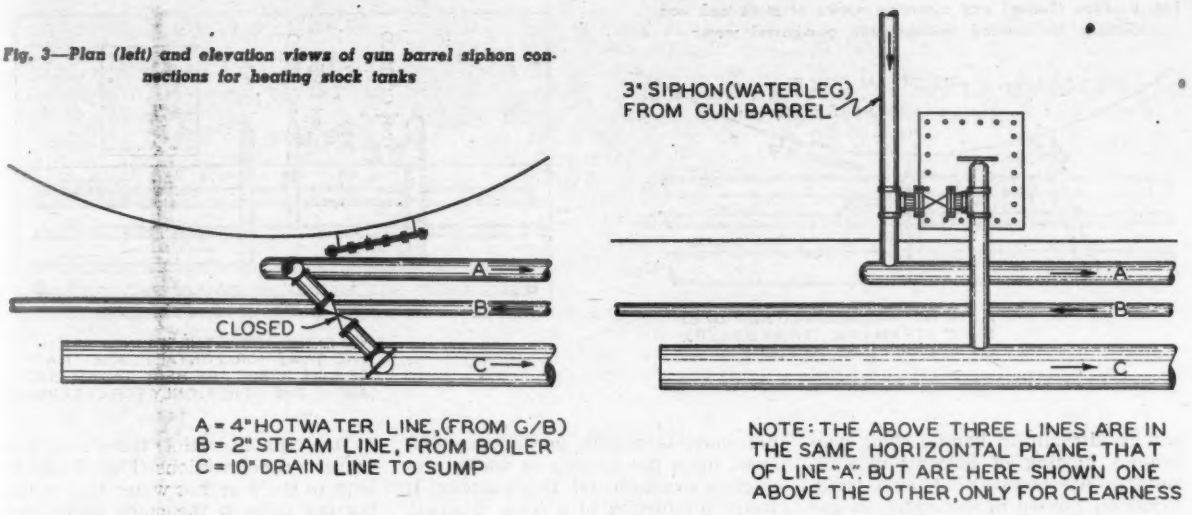


Fig. 2—Plan view of Mahoney tank battery showing hot-water, steam, and drain-line system. Detail of connections shown in Figs. 3 and 6

Fig. 3—Plan (left) and elevation views of gun barrel siphon connections for heating stock tanks


3" SIPHON (WATER LEG) FROM GUN BARREL
A
B
C
CLOSED
A = 4" HOT WATER LINE, (FROM G/B)
B = 2" STEAM LINE, FROM BOILER
C = 10" DRAIN LINE TO SUMP
NOTE: THE ABOVE THREE LINES ARE IN THE SAME HORIZONTAL PLANE, THAT OF LINE "A". BUT ARE HERE SHOWN ONE ABOVE THE OTHER, ONLY FOR CLEARNESS

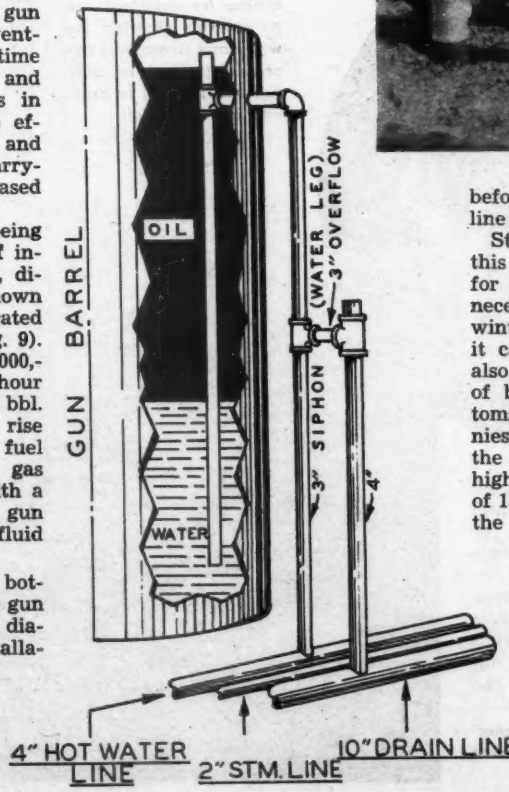
sulation. Also, since the insulation retains the heat in the gun barrels over relatively longer periods, the heaters do not have to be fired continuously as in the past. Often it is possible to maintain gun-barrel temperatures by operating the heaters as little as half time.

In addition to the economies in fuel consumption thus realized, savings are effected by the reduced load on the heaters, which lessens maintenance costs and prolongs their operating life. Also, while operating, firing control is more uniform and requires less watching. Through reduced firing temperatures and lower differential temperatures in the gun barrels, flashing of the oil is prevented or minimized. At the same time the ability to maintain higher and also more uniform temperatures in the gun barrels results in more effective breaking of emulsions and separation of water, and less carry-over into stock tanks with increased pipe-line oil recovery.

Various types of heaters are being used although in the majority of installations they are volume-type, direct-fired units. Installations shown in accompanying pictures are located in the Crooks Gap field (see Fig. 9). Each has a rated capacity of 1,000,000 B.t.u. input to fluid per hour and can heat 68 bbl. of oil and 34 bbl. of water per hour through 100° rise in temperature with maximum fuel consumption of 2,000 cu. ft. of gas per hour. They are equipped with a bottom equalizing line from the gun barrels to permit recycling of fluid should input be cut off.

The hookup for heating tank bottoms with the hot water from the gun barrel is shown in accompanying diagrams and pictures of the installation at the Mahoney field battery. Operation of the system provides for circulating the water by gravity from the gun-barrel siphon through the heating coils in the stock tanks

Fig. 4—(Right) Surface hookup for gun-barrel siphon connections. Siphon empties directly to buried hot-water line. Bypass connects to drain. Additional connections at left are for the b.s. drain and steam line

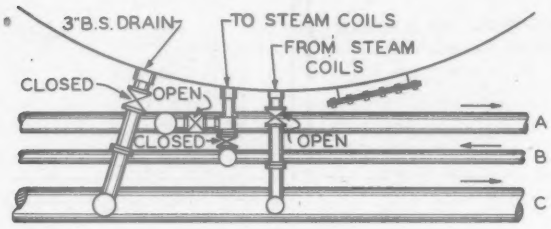


before it empties to the main drain line to the disposal sump.

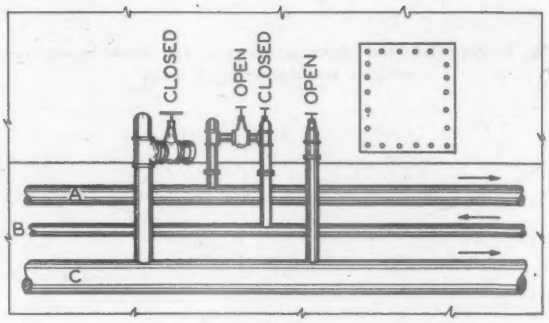
Stock tanks generally in fields of this area must include some means for heating. Not only is it usually necessary, particularly during the cold winter months, to heat the oil before it can be run to the pipe line, but also heating facilitates the removal of b.s. accumulations from the bottoms of the tanks. Pipe-line companies as a rule don't run the tank if the b.s. level is more than 10 to 12 in. high when the drawoff is at a height of 18 in., and, since in many instances the b.s. accumulation is fairly rapid, frequent cleaning of tank bottoms often is necessary. Without heat, these bottoms, consisting of a heavy, waxy b.s. emulsion, form a congealed mass that cannot be flowed

Fig. 5—Proposed gun-barrel siphon installation providing automatic overflow of excess heating water to drain

Fig. 6—Plan (below) and elevation views of stock-tank connections for heating bottoms with gun-barrel water



A = 4" HOTWATER LINE,(FROM G/B)
B = 2" STEAM LINE,(FROM BOILER).
C = 10"DRAIN LINE TO SUMP.



NOTE: THE ABOVE THREE LINES ARE IN THE SAME HORIZONTAL PLANE, THAT OF LINE "A", BUT ARE HERE SHOWN ONE ABOVE THE OTHER, ONLY FOR CLEARNESS

and is difficult to handle. This continuous heating of bottoms also results in the recovery of some additional oil carried in the emulsion and which otherwise would be discarded as waste.

For heating, either individual direct-fired heating units or steam coils usually are placed in the bottoms of the tanks. Where steam coils have been used it generally has been necessary to install a small boiler at each battery. By utilization of the waste hot water from the gun barrel as the heating medium not only is the need for this equipment eliminated but also the fuel and other operating costs incidental to it. In addition, by continuous circulation of the water through the coils the tanks can be kept warm and thus aid in the separation of any water that might be carried over from the gun barrel. Boilers or individual heating units usually are operated only when it is desired to run or clean a tank. Continuous heating of all tanks by the hot water is largely contingent, however, upon the volume of water production available for this purpose. If water production of a lease is small, it still might be possible to heat only one tank at a time.

Elevation and plan views of the Mahoney battery are shown in Figs. 1 and 2, respectively. The battery includes a 24-ft., 1,250-bbl. gun barrel with a 13-in. o.d. boot and four 1,000-bbl. stock tanks. The heater, not shown, is a large-capacity, volume type, with a 6-in. hot-oil line to the gun-barrel boot. The gun barrel has an inside siphon adjusted to hold a 9-ft. water level and 14 ft. of oil.

The siphon outlet from the gun barrel has connections (Figs. 3 and 4) both to the 4-in. hot water line to the heating coils in the stock tanks and to the 10-in. drain line to the sump. Water flow for heating tanks is direct to the 4-in. line. When the water is not used for heating, or if water production from the gun barrel should exceed the capacity of the 4-in. line and heating system, the valve in the bypass connection to the drain can be opened and the overflow run direct to the drain.

An arrangement (Fig. 5) that will provide for the automatic overflow of excess heating water has been devised and will be installed later, to eliminate the need of the valve control. The overflow outlet from the siphon leg in this hookup will be placed at a height that will maintain the necessary water head in the leg on the heating coils. Then any water production in excess of that which can be handled through the coils will overflow through the outlet line to the secondary leg which empties into the drain line, as indicated in the

Fig. 7—(Left) Surface hookup for stock-tank connections showing hot-water and steam inlet connection (center) to coils; coil outlet (right) to drain, and b.s. drain (left)

Fig. 8—Stock tank and gun barrel connections showing use of small circulating pump for rerunning tank to gun barrel

drawing. Since the 10-in. drain line is more than adequate in size to run any likely water production, there is no danger of the water backing up into the gun barrel.

Stock-tank connections for the 4-in. hot water line and the 10-drain, and also for the 2-in. auxiliary steam line which serves the battery, are shown in Figs. 6 and 7. All three lines are buried in parallel along the length of the battery, and connections are by means of short risers from the respective lines. Both the hot-water and steam-line connections are tied into the heating-coil inlet so that either hot water or steam may be used for heating. The coil outlet empties to the main drain. Valves are placed in all connections, as shown, so that any tank can be cut off the system at any time. Tank connections also include a 3-in. b.s. drain to the 10-in. drain line. From the b.s. drain, an outlet is provided for a circulating pump connection to be used to rerun the tank to the gun barrel or any other tank. (Fig. 8).

The provision for use of steam to heat the tanks is made at this battery since the volume of water produced with the oil in this field so far is relatively small, and thus the available heat from this source at times might not be sufficient for all requirements. However, it would be a precaution in any battery in the event of a shutdown of the oil heater and it became necessary to run or clean a tank. This battery does not include a boiler but should steam be needed, the company has a portable steaming unit, consisting of a Bettis steamer mounted on a trailer, which can be moved in and tied into the steam line.

Fig. 9—Oil-heater and gun-barrel installation at Crooks Gap field battery showing insulation of equipment

Electronic Control Features A.I.Ch.E. Meet

by Fabian R. Staley

NEW YORK.—The American Institute of Chemical Engineers held the first New York meeting, under the new plan for group assemblies, February 27 and 28.

The application of electronics for accurate metering transfer of liquids in process operations was discussed by Robert T. Sheen of Milton Roy pumps. A controlled volume pump, having complete positive displacement per stroke, is driven by a direct-current motor the speed of which determines the exact speed of the pump. A Mototrol or a Thymotrol is used to control electronically the motor speed. By this means a wide, stepless range of speed control for d.c. motors is provided from a.c. power circuits. Since the quantity of liquid delivered by the pump is directly proportional to pump speed, a control of motor speed is a direct control of quantity of liquid delivered.

A potentiometer is required for regulation, and motor speed is constant at a given setting from zero to full load. The motor speed follows a straight line relationship with potentiometer setting, and it may therefore be mounted in any metered setting to give automatic control in accordance with a metered variable. Application of this system has been made for automatic proportioning and for pH control. Applications are contemplated using temperature, pressure, liquid level, or conductivity as the metered variables.

Cooperation between chemical engineers and electronics engineers will lead to a wide application of electronic control in the process industries, according to Donald Fink, editor of "Electronics." In recent years the electronics engineers have devoted most of their effort to radio and communications although there should be a wide application of this new tool to industry.

Improvements in the coagulation of surface waters with activated silica was discussed by Lloyd L. Klinger. Silica carries a negative charge which attracts a colloid carrying a positive charge. Silica is generally used with other chemicals for treating water. Continuous activation of silica has been very successful. A number of patent applications have been made. Coagulating agents include carbon dioxide, sulfur dioxide, sulfur trioxide, chlorine, and acid salts.

Heat transfer characteristics of spiral heat exchangers were presented in a paper by A. M. Hargis, American Heat Reclaiming Corp. The standard heat transfer equations were considered in the light of the experimental results obtained when heating or cooling oil, water, brine, and steam. When heating or cooling oils in the spirals under viscous-flow conditions over-all coefficients are shown experimentally to be from 50 to 100 per cent higher than the values calculated using conventional equations.

Frank B. Long has retired as vice president of Oklahoma Natural Gas Co. after nearly 20 years of service with the company.

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CORROSION by Hydrofluoric Acid

by W. Z. Friend and H. O. Teeple

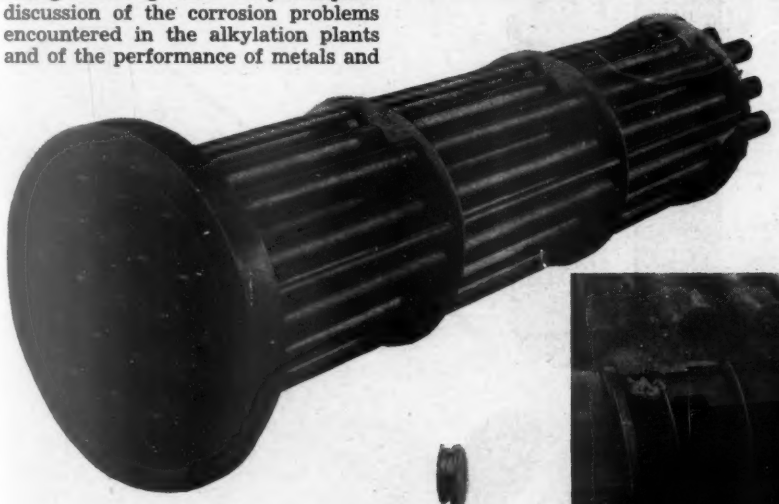
This article records results of laboratory and plant corrosion tests in hydrofluoric acid of various concentrations. The results enable summarization, with considerable accuracy, of the suitable fields of applications, and limitations, of common metals and alloys in processes involving hydrofluoric acid. The authors are with the development and research division of The International Nickel Co.

THE corrosive properties of hydrogen fluoride and hydrofluoric acid have been the subject of considerable study during the past few years, principally because of the use of this material as a catalyst in hydrocarbon alkylation and in other organic syntheses. Some of the present and prospective uses for hydrogen fluoride and other fluorides in organic reactions have been summarized by Finger.[1] The operating features of the hydrofluoric acid alkylation process for production of isoparaffins have been described by Frey.[2] Holmberg and Prange[3] have given a very complete discussion of the corrosion problems encountered in the alkylation plants and of the performance of metals and alloys under the hydrofluoric acid conditions encountered. They have provided a generous amount of service and corrosion test data. Further information on the performance of construction materials in the mechanical operation of these plants has been provided by Findlay.[4]

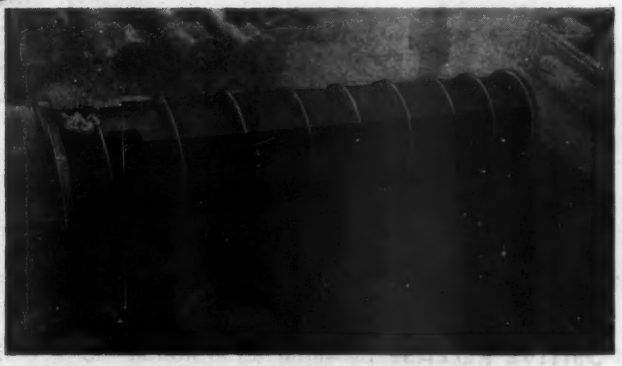
In addition to the corrosion problems encountered in the use of hydrofluoric acid, have been similar ones associated with its greatly expanded production. Some of these, particularly relating to the production and handling of anhydrous acid, have been described by Fehr.[5]

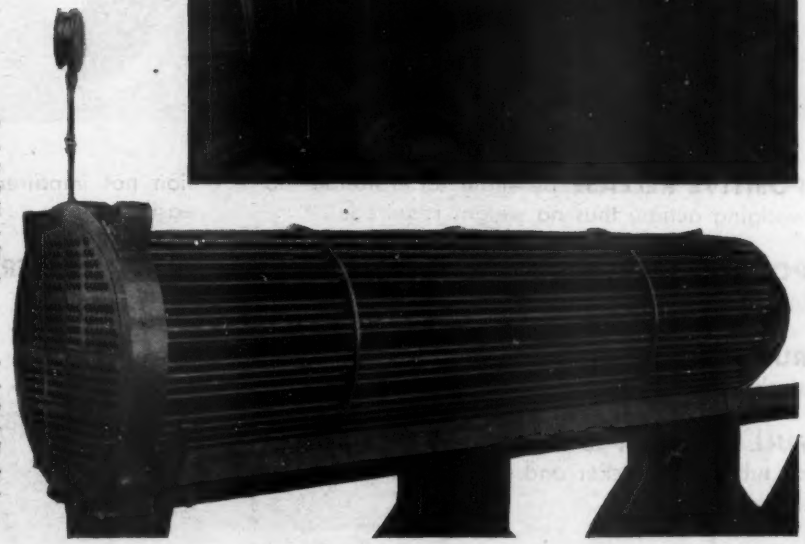
The purpose of the present authors is to record the results of some additional laboratory and plant corrosion tests in hydrofluoric acid of various concentrations. These results, when combined with the data already published, make it possible to summarize, with a reasonable degree of accuracy, the suitable fields of application, and the limitations, of the common metals and alloys in processes involving hydrofluoric acid.

From a corrosion standpoint, the performance of hydrofluoric acid divides itself into two parts: (1) the anhydrous acid or its water solutions of very high acid concentration, and (2) the more dilute acid solutions. For example, carbon steel at moderate temperatures is resistant to anhydrous acid and to acid concentrations above 75 to 80 per cent HF, while it is not resistant to lower concentrations.



Below: Completed heat-exchanger unit which contains Monel tube bundle





Above: This bundle is used on a kettle-type reboiler approximately 11 ft. long and 36 in. in outside diameter, one end tapering to a 16-in. flange. Tube bundle mates with this 16-in. flange. The tube sheet of Monel-clad is 18½ in. o.d., by 1 15/16 in. thick. Nineteen holes are bored for 1.9-in. i.p.s. Monel tubing. Design pressure of unit is 125 lb., and design temperature 650° F.

Right: A 30-in. tube bundle 10 ft. long employing 136 seamless Monel tubes of 1-in. o.d. by 12 gage. Tube sheets of composite construction using a 3 7/16-in.-thick carbon-steel sheet faced with a 1-in.-thick Monel sheet. The Monel facing was attached to the carbon steel by plug welding and a circumferential weld on the outside edge

POSITIVE RELEASE by slight left rotation—no wedging action; thus no weight required.

POSITIVE SEAL inside and out by proper packing of both box and pin.

RUGGED CONSTRUCTION from annealed stock, heat-treated for stress relief and strength.

FULL HOLE TYPES for use on wash pipe — or on tubing for packer and screen setting; circulation not impaired; passes wire line equipment easily.

EARLY DELIVERY from factory.

HOMCO

HOUSTON OIL FIELD MATERIAL COMPANY, Inc.
HOUSTON, TEXAS

OIL INDUSTRY'S MOST Complete SERVICE

Lead, on the other hand, is resistant to concentrations below 65 to 70 per cent but not to higher concentrations.

In the alkylation process and in some of the other organic reactions referred to above, hydrofluoric acid or fluorides initially enter the system in anhydrous form. However, water is frequently picked up from other feed materials or by leakage from water-cooled equipment and corrosion by dilute solutions is encountered in regeneration equipment where substantially anhydrous hydrogen fluoride is recovered by distillation from its water solutions, often at elevated temperatures. In such equipment the acid concentration will range from anhydrous to the constant-boiling acid solution containing approximately 38 per cent HF and boiling at 248° F. This also applies to the production of anhydrous acid by distillation from its water solutions. Dilute hydrofluoric acid solutions are encountered in a number of other common processes, such as the pickling of cast iron and etching of glass.

Laboratory Corrosion Tests

The results of laboratory corrosion tests of metals and alloys in hydrofluoric acid over a wide range of concentrations and temperatures, are summarized in Table 1. Most of these tests were made in metal containers; Monel, nickel, or lead for the dilute solutions, and Monel or steel for the concentrated solutions. A few tests in dilute solutions were made in glass containers. Test specimens in each case were completely immersed in the solution and not in contact with the container or with other metals. Except where velocities are specified, the tests were made in quiet liquid without agitation. The depth of immersion in open containers was such that corrosion probably was not significantly increased by air diffusion. In the "air-free" tests, nitrogen was bubbled through the solutions in closed containers. In "air-saturated" tests, air was bubbled through the solutions.

Corrosion Tests in Alkylation Plants

The most corrosive conditions in hydrofluoric acid alkylation plants normally exist in the acid-regeneration units, including the acid-regeneration column and its preheater, and the acid-dehydrating column. As the alkylation process proceeds, the hydrofluoric acid gradually becomes contaminated with high-molecular-weight organic material and water which remain dissolved in the acid. A portion of the acid is continuously removed from the cycle, heated, and distilled from the organic material in the regeneration column. A portion of the overhead acid and water from the column goes to the dehydrating column where substantially anhydrous HF is distilled overhead and the water removed from the bottom as a hydrofluoric acid solution of 38 to 45 per cent concentration.

In order to determine the performance of metals and alloys in these units under operating conditions, corrosion tests have been made in various parts of the regeneration equipment in three refineries. In one refinery tests were made in the top of the acid-regeneration column and in the inlet and outlet ends of its preheater. In this refinery tests were also made in the top of an HF stripper tower. In a second refinery, tests were made in the top and bottom of the regeneration column. In the third refinery, tests were made in the bottom of the regeneration column and in the bottom of the dehydration column. The results of these corrosion tests are given in Table 2. The operating conditions existing during each test are given as reported by the refineries in which the tests were made.

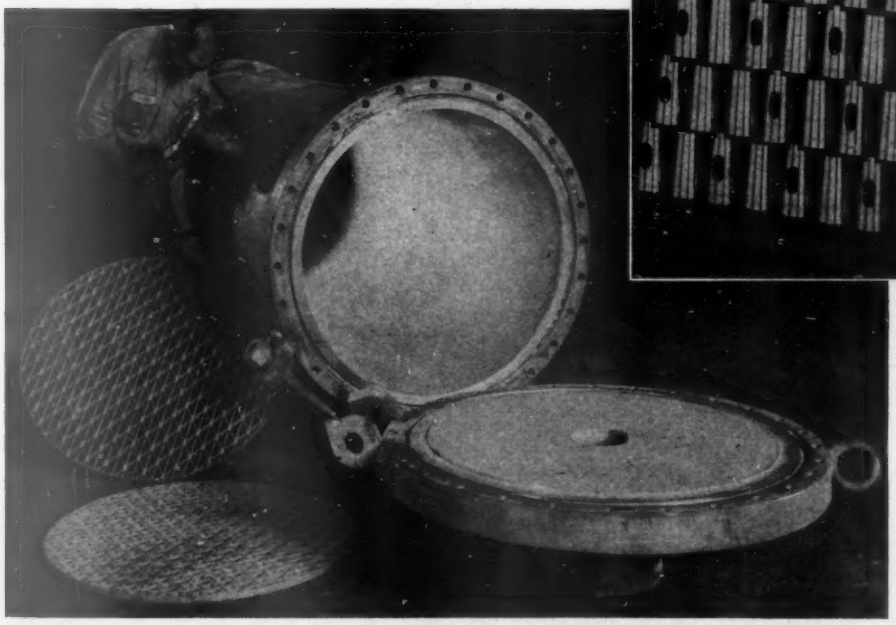
Other Plant Corrosion Tests in Hydrofluoric Acid Solutions

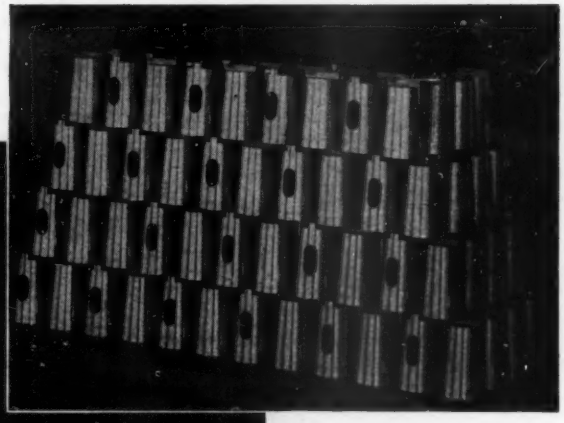
Corrosion tests have also been made in hydrofluoric acid solutions in operating equipment in plants using this acid for other purposes. In Table 3 are given the results of tests in hydrofluoric acid pickling solutions used for the pickling of cast iron. At one plant the tests were in 6 per cent acid at 170° F., and in other plant in 10 per cent acid at room temperature.

Table 4 gives the results of tests in a storage tank in which 60 per cent hydrofluoric acid was stored and diluted to 40 per cent concentration for use in the preparation of glass-etching solutions.

Table 5 gives the results of tests in a tank used for the storage of a commercial 60-65 per cent hydrofluoric

Below: Monel-lined hydrofluoric acid regenerator column 17 ft. high by 3 ft. 1 in. i.d. with 1/16-in. minimum lining of Monel. The two grids are of Monel construction and are trays for holding the raschig rings or tower packing. Tower packing for this tower was made by winding wire into close-coiled springs





Above: Group of Monel plugs which are to be used in valves to withstand hydrofluoric acid

acid at the plant of a producer of the acid. In this case, fluosilicic acid, sulfuric acid, and a small amount of iron were present as impurities in the acid.

Table 6 gives the results of tests in an impure 12 per cent hydrofluoric acid solution resulting from the water absorption of fluorine gas from a chemical process. Small amounts of fluosilicic acid and iron were present as impurities. Several galvanic couples were tested along with the insulated specimens of various materials.

From the above test data and other test results and service experience previously referred to, it is possible to make some general conclusions as to the performance of the common metals and alloys in hydrofluoric acid.

Monel

Experience with Monel in a variety of applications involving hydrofluoric acid has shown it to be usefully resistant to all concentrations of the acid including anhydrous acid over a considerable range of temperatures. It is, in general, the most resistant material with the exception of platinum and silver. In hydrofluoric acid-water solutions, except in those which are highly aerated, Monel has shown satisfactory resistance up to 250° F., the highest temperature for which test data are available. In anhydrous acid, it is resistant to considerably higher temperatures although the upper temperature limit has not yet been established.

The indications are that the corrosion resistance of Monel is not adversely affected by the presence of small amounts of reducing sulfur compounds or of sulfuric acid in hydrofluoric acid solutions. However, its corrosion rate may be appreciably increased by a high degree of aeration of the solution. Reference to Table 1 will show the effect of air saturation of 25 and 50 per cent acid solutions on the corrosion rate of Monel at 86° F. and 176° F. As a general rule, aeration is not encountered in closed vessels associated with the handling of hydrofluoric acid and corrosion rates in operating equipment have normally been of the order of those shown for unaerated solutions. In an open tank handling acid solutions, there might possibly be a certain amount of accelerated attack at the liquid-air line. The corrosive effect of a high degree of aeration would probably be most noticeable where considerable velocity was encountered as in pumps. The air-saturated tests in Table 1 were made at velocities of 42 to 73 ft. per minute.

The continuous presence of appreciable amounts of oxidizing salts such as cupric or ferric salts in hydrofluoric acid solutions will increase the corrosion of Monel in the same manner as a high degree of aeration. This is illustrated by the laboratory corrosion test results given in Table 7 in which varied amounts of iron were present in boiling solutions encoun-

TABLE 1—LABORATORY CORROSION TESTS IN HYDROFLUORIC ACID*

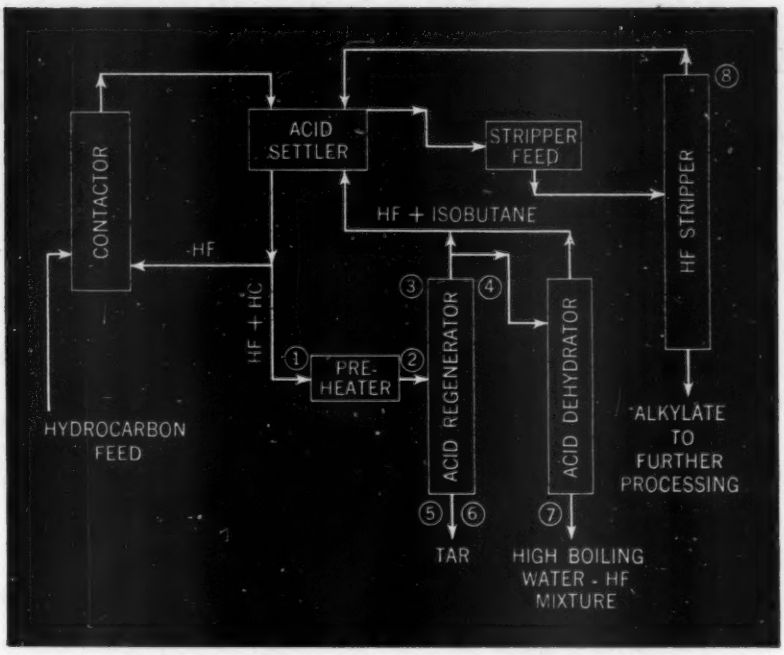
Acid Conc. % HF by wt.	Temp. (°F.)	Duration of test days	Other test conditions—	Corrosion rate, inch penetration per year: Monel	70-30 Copper-nickel alloy	Copper	10% Al. bronze	Fine silver	Carbon steel	Nickel	Inconel	Type 316 Chemical lead	Type 316 stainless steel	Ni-Resist	Hastelloy B	Hastelloy C
10	70	..	Immersed in open container	0.009	....	....	....	....	....	....	....	....	....	....	....	....
10	136	0.8	Immersed in open container	0.008	....	....	....	....	....	....	....	....	....	....	....	....
18	Room	..	Immersed in open container	0.0003	....	....	0.0007	....	....	....	....	....	....	....	....	....
25	86	6	Air-free, immersed in closed container, velocity 42-73 ft./min.	0.0002	....	....	....	....	....	....	....	....	....	....	....	....
25	86	1	Air-saturated, immersed in closed container, velocity 42-73 ft./min.	0.037	....	....	....	....	....	....	....	....	....	....	....	....
25	143	7	Immersed in open container	0.007	....	....	....	....	....	....	....	....	....	....	....	....
25	176	6	Air-free, immersed in closed container, velocity 42-73 ft./min.	0.0024	....	....	....	....	....	....	....	0.009	....	....	....	....
25	176	1	Air-saturated, immersed in closed container, velocity 42-73 ft./min.	0.011	....	....	....	....	....	....	....	0.334	....	....	....	....
30	70	..	Immersed in open container	0.008	....	0.009	....	....	0.26	0.009	....	....	....	....	....	....
30	70	4	Immersed in open container	0.004	....	....	....	....	....	....	....	....	....	....	....	....
35	240	8	Immersed in closed container	0.0009	....	....	....	....	0.12	....	....	....	....	....	....	....
35	248	6	Air-free, immersed in closed container	0.0011	....	....	....	0.0005	....	....	....	....	....	....	....	....
35	248	1	Air-saturated, immersed in closed container	0.14	....	....	....	0.015	....	....	....	....	....	....	....	....
38	230	2	⅝ immersed in carbon bomb with some entrapped air	0.047	0.036	0.047	0.046	0.004	2.90	0.110	0.113	0.146	2.00	0.26	0.065	0.055
40	Room	..	Immersed in open container	....	....	....	....	....	....	....	....	....	....	....	0.003	0.003
40	130	..	Immersed in open container	....	....	....	....	....	....	....	....	....	....	....	0.001	0.010
48	70	..	Immersed in open container	0.0001	....	0.009	....	....	0.52	0.009	....	....	....	....	....	....
48	68	..	Immersed in open container	0.004	....	....	....	....	....	....	....	....	....	....	....	....
48	240	8	Immersed in closed container	0.0009	....	....	....	....	....	0.009	....	....	....	....	....	....
50	86	6	Air-free, immersed in closed container, velocity 42-73 ft./min.	0.0001	....	....	....	....	....	....	....	....	....	....	....	....
50	86	1	Air-saturated, immersed in closed container, velocity 42-73 ft./min.	0.008	....	....	....	....	....	....	....	0.034	....	....	....	....
50	Room	4	Immersed in open container	0.005	....	....	....	....	....	....	....	....	....	....	....	....
50	176	6	Air-free, immersed in closed container, velocity 42-73 ft./min.	0.0006	....	....	....	....	....	....	....	0.025	....	....	....	....
50	176	1	Air-saturated, immersed in closed container, velocity 42-73 ft./min.	0.039	....	....	....	....	....	....	....	0.048	....	....	....	....
60	Room	2	Immersed in open container	0.015	....	....	....	....	....	....	....	....	....	....	....	....
60	Room	..	Immersed in open container	....	....	....	....	....	....	....	....	....	....	....	0.002	0.004
70	70	8	Immersed in closed container	0.0001	....	0.035	....	....	0.23	0.0009	....	....	....	....	....	....
70	122	4	Immersed in closed container	0.0042	....	....	....	....	....	....	....	....	....	....	....	....
70	240	8	Immersed in closed container	0.017	....	....	....	....	....	0.044	....	....	....	....	....	....
93	70	8	Immersed in closed container	0.003	....	0.026	....	....	0.035	0.006	....	....	....	....	....	....
93	100	..	Immersed in closed container, velocity 1,700 r.p.m.	....	....	0.15	....	....	0.17	....	....	....	....	....	....	....
98	70	8	Immersed in closed container	0.002	....	....	....	....	0.007	....	....	....	....	....	....	....
98	100	3.6	⅝ immersed in carbon bomb with some entrapped air	0.002	0.002	0.006	0.006	0.002	0.005	0.002	0.002	1.48	0.002	0.007	0.004	0.001
98	240	8	Immersed in closed container	0.002	....	....	....	....	0.70	0.003	....	....	....	....	....	....
100	50	..	Immersed in closed container, velocity 1,700 r.p.m.	0.0009	....	0.009	†0.004	....	0.009	....	....	....	....	....	....	....
100	100	..	Immersed in closed container, velocity 1,700 r.p.m.	0.0009	....	....	....	....	0.018	....	....	....	....	....	....	....
100	122	4	Immersed in closed container	0.0005	....	....	....	....	....	....	....	....	....	....	....	....
100	300	8	Immersed in closed container	0.0009	....	....	....	....	0.79	0.003	....	....	....	....	....	....

*Data obtained from tests by International Nickel Co., Inc., and from private communications. †Red brass.

tered in the production of hydrofluoric acid. These tests were made with test specimens immersed in the solutions in open Monel beakers.

The presence of ferrous or cuprous salts in the acid solutions does not increase the corrosion rate of Monel in unaerated solutions.

Tests with highly stressed specimens in commercially pure acid solutions, and general plant experience, have shown that Monel is not subject to stress-corrosion cracking in hydrofluoric acid. However, it is subject to stress-corrosion cracking in strong fluosilicic acid solutions such as those containing 22 per cent H_2SiF_6. Stress corrosion in fluosilicic acid can be prevented by giving the Monel equipment suitable stress-relieving heat treatment, such as 1 hour at 1,000° F., before placing in service. While no conclusive determinations have been made of the maximum amount of fluosilicic acid which can be tolerated in hydrofluoric acid without the possibility of stress corrosion, it would be concluded that, if the hydrofluoric acid in service is to be circulated continuously in contact with a high-silica material so that there would be a considerable accumulation of H_2SiF_6, it would be advisable to stress-relieve



Simplified HF regeneration flow sheet showing points of plant tests (Test numbers refer to Table 2)

TABLE 2—CORROSION TESTS IN HYDROFLUORIC ACID ALKYLATION PLANTS

Test Conditions

Test 1.—Inlet side of preheater channel. Liquid composition: 79 to 92 per cent HF, 0.8-2.5 per cent water, remainder isobutane and acid-soluble oil. Temperature: Ave. 120° F., Max. 135° F. Duration of test: 111 days.

Test 2.—Outlet side of preheater channel. Composition same as Test 1. Temperature: Ave. 235° F., Max. 260° F. Duration of test: 111 days.

Test 3.—Top of regeneration column just below vapor outlet. Composition: 90-95 per cent HF and 5-10 per cent isobutane. Acid phase: 90-95 per cent HF, 0.5-2.5 per cent water, 1.0-5.0 per cent oil. Temperature: Ave. 275° F., Max. 300° F. Pressure 120-150 psi. Duration of test: 70 days.

Test 4.—Top of regeneration column. Composition: equal parts of 93 per cent HF and isobutane vapor. Temperature: Ave. 215° F., Max. 220° F. Duration of test: 49 days.

Test 5.—Bottom of regeneration column in acid tar containing 1-10 per cent HF—Water in a 1:1 ratio. Average temperature: 250° F. Duration of test: 49 days.

Test 6.—Bottom of regeneration column. Feed to column contains 85.2 per cent HF, 1.6 per cent water and oils. Test made beneath grid plate of column. Feed 194 bbl. per day. Temperature: Ave. 220° F., Max. 250° F. Duration of test: 45 days.

Test 7.—Bottom of dehydrator column beneath bottom plate. Feed contains 89.3 per cent HF, and 1.6 per cent water. Feed rate 15 bbl. per day. Temperature: Ave. 225° F., Max. 250° F. Duration of test: 45 days.

Test 8.—Top of HF stripper column above top tray. Composition of vapor 10 per cent HF and 90 per cent light hydrocarbons. Temperature: Ave. 110° F., Max. 150° F. Duration of test: 117 days.

	Corrosion rate, inch penetration per year							
	Regenerator preheater		Regenerator column				Dehydrator Column	HF Stripper Column
Material—	Inlet Plant A Test 1	Outlet Plant A Test 2	Top Plant A Test 3	Top Plant B Test 4	Bottom Plant B Test 5	Bottom Plant C Test 6	Bottom Plant C Test 7	Top Plant A Test 8
Monel	0.0003	0.0005	0.0005	0.0005	0.0075	0.0071	0.022	0.0007
"S" Monel	.....	.....	....	0.0014	0.010	0.011	0.039	.....
Nickel	0.0011	0.0035	0.013	0.014	0.011	0.018	0.068	0.0007
Inconel	0.0008	0.019	0.0007	0.025	0.023	0.025	>0.13[1]	0.0005
70-30 Copper-Nickel	0.0011	0.006	0.0007	0.0053	0.021	.....	....	0.0013
Copper	0.019	>0.052[1]	>0.082[1]	>0.12[1]	>0.12[1]	>0.13[1]	>0.13[1]	0.0034
Silicon bronze	0.012	>0.050[1]	>0.079[1]	.....	.....	>0.12[1]	>0.12[1]	0.0069
18-8 Stainless (Type 302)	....	....	.....	>0.11[1]	0.036	.....	.....	.....
18-8 Stainless (Type 304)	....	....	.....	0.063[4]	0.045	0.011	>0.12[1]	.....
18-8 Mo Stainless (Type 316)	....	....	.....	0.001	0.0015	.....	.....	.....
Hastelloy A	....	....	.....	.....	.....	0.0045	0.016	.....
Hastelloy B	....	....	.....	0.003	0.004	0.0045	0.015	.....
Hastelloy C	....	....	....	0.002	0.014	0.0021	0.036	.....
Mild Steel	0.027	>0.10[2]	>0.16[2]	0.20[5]	0.036[7]	0.15	>0.24[2]	0.018
Dowmetal J	0.04	0.019	0.003	0.003[9]	0.014	0.003[9]	0.009[10]	0.0002
Aluminum 2S	....	....	.....	0.035	>0.12[1]	.....	.....	.....
Chemical Lead	....	....	....	.....	.....	>0.13[2]	>0.13[2]	.....
RT Silver brazing alloy	0.0012	>0.026[3]	0.017[11]	.....	.....	.....	.....	0.0016
Easy-Flo silver brazing alloy	0.0008	0.018[11]	0.019[11]	.....	.....	.....	.....	0.0014

>Greater than. 1. Completely corroded away. Original thickness 0.032 in. 2. Completely corroded away. Original thickness 0.062 in. 3. Completely corroded away. Original thickness 0.015 in. 4. Perforated by pitting. Original thickness 0.032 in. 5. Perforated by pitting. Original thickness 0.062 in. 6. Pitted to maximum depth of 0.002 in. during test. 7. Pitted to maximum depth of 0.008 in. during test. 8. Pitted to maximum depth of 0.006 in. during test. 9. Completely corroded away. Original thickness 0.032 in. 10. Pitted to maximum depth of 0.012 in. during test. 11. Specimens embrittled during test.

TABLE 3—PLANT CORROSION TESTS IN 6 AND 10 PER CENT HYDROFLUORIC ACID PICKLING SOLUTIONS

Test specimens immersed in solutions in pickling tanks used for pickling cast iron.

Material	Corrosion Rate, Inch per Year — 6% HF Temperature: 170° F. 4 Day Test	6% HF Temperature: 170° F. 28 Day Test	10% HF Temperature: Room 30 Day Test
Monel	0.0008	0.0002	0.0001
Nickel	0.35	.....	0.0001
Inconel	0.363	0.068	0.0001
Copper	.....	0.0001	.....
Silicon bronze	.....	0.0001	.....
18-8 Stainless (Type 304)	1.10	a	0.0004
18-8 Mo Stainless (Type 316)	.....	.....	0.0001
Ni-Resist	0.68	0.54	0.001
Cast iron	b	b	0.22

a. Specimens completely corroded away. Original thickness 0.032 in.
b. Specimens completely corroded away. Original thickness $\frac{1}{16}$ in.

Monel vessels which have been welded or may be otherwise subject to high stresses in fabrication or service.

Monel is comparatively insensitive to effects of velocities which considerably increase the corrosion rates of such materials as copper and bronzes in hydrofluoric acid. This is shown by the satisfactory performance of Monel bubble caps in HF distillation columns. Other examples of suitable applications of Monel for such equipment as acid recovery towers and heaters, valves, bolts, pumps, and pipe lines in the most corrosive conditions encountered in alkylation-plant operation, have been cited in the references,[3,4] already mentioned.

The corrosion rates for Monel can be applied equally well to "K" Monel, a wrought age-hardening nickel-copper alloy, and to the cast alloys, "H" Monel (containing approximately 3 per cent silicon) and "S" Monel (containing approximately 4 per cent silicon). Because of the high mechanical properties obtainable by heat treatment, "K" Monel is useful for such parts as pump shafts, valve stems, and bolts, which are subject to high stresses.

"S" Monel

"S" Monel, having high hardness and galling resistance, is useful for such parts as gate and plug valves, pump parts, and sometimes for non-lubricated bearings, where seizing must be avoided or where "freezing" of steel parts might occur. It can be used as solid castings or can be applied as a hard-surfacing overlay.

In view of the silicon content of "S" Monel a particular study has been made of its corrosion resistance in hydrofluoric acid. The results of a number of corrosion tests are given in Tables 8 and 9. It will be noted that corrosion rates were of the same order as those for wrought (low-silicon) Monel under identical conditions, as given in Table 1. From Table 9, it will be observed that silicon contents as high as 6.6 per cent did not impair corrosion resistance of these materials. No study was made of alloys with higher silicon contents.

Copper and High-Copper Alloys

Available data indicate that copper and the high-copper alloys including

TABLE 4—PLANT CORROSION TEST IN STORAGE OF 40 TO 60 PER CENT HYDROFLUORIC ACID

Acid diluted from 60 to 40 per cent in storage tank. Test specimens immersed in solution in tank. Temperature: Atmospheric. Duration of test: 33 days.

Material	Corrosion Rate, Inch per year.
Monel	0.003
Copper	0.003
Yellow Brass	0.007
Chemical Lead	0.003

TABLE 5—PLANT CORROSION TEST IN STORAGE OF COMMERCIAL 60-65 PER CENT HYDROFLUORIC ACID

Acid contains 1.5-2.5% Fluosilicic acid, 0.3-1.25% Sulfuric acid, and 0.01-0.03% Iron. Test specimens immersed in solution in storage tank. Temperature: 60-80° F. Duration of test: 28 days.

Material	Corrosion Rate, Inch per year.
Monel	0.022
"S" Monel	0.008
Nickel	>0.20
Inconel	0.15
Copper	0.012
Ni Bronze (88 Cu, 5 Ni, 5 Sn, 5 Zn)	0.017
Chemical Lead	0.016
18-8 Stainless (Type 304)	>0.21
18-8 Mo Stainless (Type 316)	>0.19
Mild Steel	0.17
Ni-Resist	0.16
Cast Iron	0.22

>Greater than. Specimens completely destroyed during test.

red brass, silicon bronze, aluminum bronze, phosphor bronze, commercial bronze, and admiralty brass, are substantially equal in their performance in hydrofluoric acid. Under conditions of low velocity and absence of aeration, they appear to be usefully resistant to hydrofluoric acid-water solutions below about 70 per cent concentration at all temperatures up to the boiling points of these solutions. Within this range of conditions they are among the most resistant materials. In dilute solutions corrosion rates are considerably increased by aeration or the presence of oxidizing salts in the acid.

In anhydrous acid or very strong concentrations of the acid, the upper temperature limit for satisfactory performance of these materials appears to be about 175° F. At higher temperatures, high corrosion rates may be

TABLE 6—PLANT CORROSION TESTS IN IMPURE 12 PER CENT HYDROFLUORIC ACID

Acid contains approximately 12% HF, 0.2% H_2SiF_6, and 1 gm. per liter Fe_2O_3 as ferric salts. Test specimens immersed in solution resulting from water absorption of fluorine from chemical process. Velocity 3.2 ft. per min. Average temperature: 182° F. Duration of test: 7 days.

Material	Corrosion Rate, Inch per Year
Uncoupled	
Monel	0.012
Nickel	0.004
Inconel	0.009
Copper	0.013
Silicon bronze	0.009
18-8 Stainless (Type 302)	0.16 a
18-8 Mo Stainless (Type 316)	0.70 a
Easy-Flo silver brazing alloy	0.009
RT silver brazing alloy	0.011
Silver	0.002
Galvanic Couples	
Monel	0.013
Silver	0.0005
Monel	0.008
Easy-Flow silver brazing alloy	0.017
Monel	0.015
RT silver brazing alloy	0.006

a Specimens perforated by cracking due to stress corrosion at machined edges and code-letter stampings.

obtained as shown by a number of the tests in Table 2.

Copper and the above high-copper alloys are especially sensitive to high-velocity conditions in strong hydrofluoric acid and may be corroded rapidly at the velocities associated with bubble-cap or heat exchanger operation.[2]

Yellow brass has been reported to be subject to season cracking in hydrofluoric acid.[2]

Copper-Nickel Alloys

The copper-nickel alloys, particularly those containing 70 per cent copper and 30 per cent nickel, behave somewhat differently from other high-copper alloys. They are considerably less sensitive to velocity conditions and are resistant to anhydrous or high-strength hydrofluoric acid at higher temperatures than copper, though not to as high temperatures as Monel. They can be considered as being next to Monel in general performance. Their principal uses have been in heat-exchanger tubes in applications where acid concentrations may vary from dilute to anhydrous.

Carbon Steel

Carbon steel is usefully resistant to hydrofluoric acid concentrations above 75-80 per cent, and particularly to essentially anhydrous acid, at temperatures up to about 150° F. It is subject to rapid attack by solutions below 70 per cent concentration,

TABLE 7—LABORATORY CORROSION TESTS OF MONEL IN BOILING 67-68 PER CENT HYDROFLUORIC ACID SOLUTIONS CONTAINING IMPURITIES SHOWN

Duration of tests: 4¼ hours

	Impurities in solution, % — H_2SiF_6	H_2SO_4	Iron	Corrosion rate, inch per year
Test 1	3.25	1.30	Trace	0.017
Test 2	2.77	1.30	0.30	0.056

even at atmospheric temperature, and by anhydrous acid at temperatures above 150° F.

Fortunately, in most of the alkylation process in which hydrofluoric acid is encountered, it is in substantially anhydrous form and at moderately low temperatures, so that carbon steel can be used for most of the major equipment except that involved in the acid regeneration units. Several years' operating experience in alkylation plants and acid-manufacturing plants have confirmed the satisfactory performance of steel within the limits specified. Holmberg and Prange[3] report that corrosion rates of about 0.01 in. per year are experienced in the low-temperature parts of HF alkylation equipment and rates of 0.03 to 0.05 in. per year in the sections handling nearly anhydrous acid at 150° F.

A thoroughly deoxidized or killed steel in which nonmetallic inclusions are a minimum, is reported to be more resistant than semikilled steel to attack by anhydrous hydrofluoric acid.[5] Cases of blistering of steel in certain parts of alkylation equipment have been associated with impurities present in the semikilled steel used.[5]

Reports of cracking of hardened alloy steel bolts, valve plugs, and springs indicate that these hardened steels may be subject to embrittlement in hydrofluoric acid whereas soft unhardened steels are not.[4] Soft low-carbon steel is apparently not subject to stress-corrosion cracking in this acid since no cases of this type of attack have been reported.

Carbon steel, when exposed continuously to anhydrous hydrofluoric acid, acquires a tight, adherent scale which will interfere with the operation of moving parts such as plug valves or pump rings having close clearances. Consequently it is advisable to provide sufficiently large clearances to allow for this scale formation, or to use a material such as Monel which does not acquire such a scale.

Nickel

Limited experience with nickel indicates that in dilute hydrofluoric acid solutions its corrosion resistance may be limited to temperatures below about 170° to 180° F. In a commercial 60-65 per cent acid, it was corroded severely at atmospheric temperature. Its performance in dilute commercial solutions has been somewhat erratic due to the fact that it may or may not form a protective oxide film when iron salts are present, depending upon the strength of the oxidizing conditions.

In anhydrous hydrofluoric acid, nickel is resistant even at considerably elevated temperatures, and is one of the most resistant materials for high temperature operation.

Inconel

Inconel is resistant to aqueous hydrofluoric acid solutions at atmospheric temperature and sometimes to temperatures as high as 160 to 170° F. Near the limiting temperature it is less resistant than nickel. The presence of small amounts of ferric salts in commercial solutions is favorable to the performance of Inconel. Inconel is resistant to essentially anhydrous acid at elevated temperatures but limiting temperatures have not been established.

Hastelloy Alloys

Available data indicate that Hastelloy alloys A, B, and C should demonstrate useful resistance to hydrofluoric acid-water solution of all concentrations over a considerable range of temperatures. From the standpoint of weight loss the A and B alloys appear to be resistant at temperatures practically up to the boiling points of the solutions and Hastelloy C to somewhat lower temperatures. However, cases of severe intergranular attack of Hastelloys A and B in hot 40 to 50 per cent hydrofluoric acid solution have been reported.[5] From the limited data available, Hastelloy D, a cast alloy containing 85 per cent nickel and 10 per cent silicon, appears to be resistant to hydrofluoric acid solutions at moderate temperatures. For example, laboratory corrosion tests in 40 per cent acid gave rates of 0.001 i.p.y.* at room temperature and 0.003 i.p.y. at 130° F. In 60 per cent acid at room temperature, the rate was 0.0024 i.p.y. In view of the high silicon content of Hastelloy D it probably would be advisable to make corrosion tests under the specific operating conditions before using it.

In anhydrous acid, Hastelloys A, B, and C appear to be resistant at elevated temperatures, with no information on the maximum temperature limit.

Austenitic Stainless Steels

The austenitic stainless steels including Types 302, 304, 347, 321, and 316 have been found to be resistant to dilute aqueous hydrofluoric acid at atmospheric temperature but are subject to severe corrosion by the hot acid solutions. Types 304 and 316 were severely corroded by commercial 60-65 per cent acid at atmospheric temperature. In an impure 12 per cent hydrofluoric acid solution at 182° F., reported in Table 6, specimens of both materials suffered transcrystalline cracking due to stress corrosion. In another case,[5] cold worked 18-8 stainless suffered stress-corrosion cracking in hot 40 to 50 per cent acid.

All of these stainless steels are apparently resistant to anhydrous hydrofluoric acid even at somewhat elevated temperatures. However, with some water present, as in the regeneration column tests in Table 2, Type 316 stainless was considerably more resistant than Type 304 stainless at 215° to 250° F. Cold worked 18-8 stainless did not suffer stress-corrosion cracking in a one-week test in anhydrous acid at 150° F.[5]

Chemical Lead

Chemical lead appears to be usefully resistant to unaerated aqueous hydrofluoric acid solutions under about 60 to 65 per cent concentration at temperatures up to about 175° F. Its corrosion rate is considerably increased by a high degree of aeration particularly in the more dilute solutions. Lead is not resistant to anhydrous acid nor to aqueous solutions above about 65 per cent concentration.

Silver Brazing Alloys

The corrosion test results given in Tables 2 and 6, indicate that the silver brazing alloys, RT (60 per cent Ag, 25 per cent Cu, 15 per cent Zn) and Easy-Flow (50 per cent Ag, 15.5 per cent Zn, 18 per cent Cd) are usefully resistant to unaerated dilute hydrofluoric acid solutions, even when hot, and to essentially anhydrous acid at temperatures up to about 175° F. In

*Inch penetration per year.

TABLE 8—CORROSION OF "H" MONEL AND "S" MONEL BY HYDROFLUORIC ACID SOLUTIONS

Tests made in closed Nickel autoclave. Velocity: 42 to 73 ft. per min.

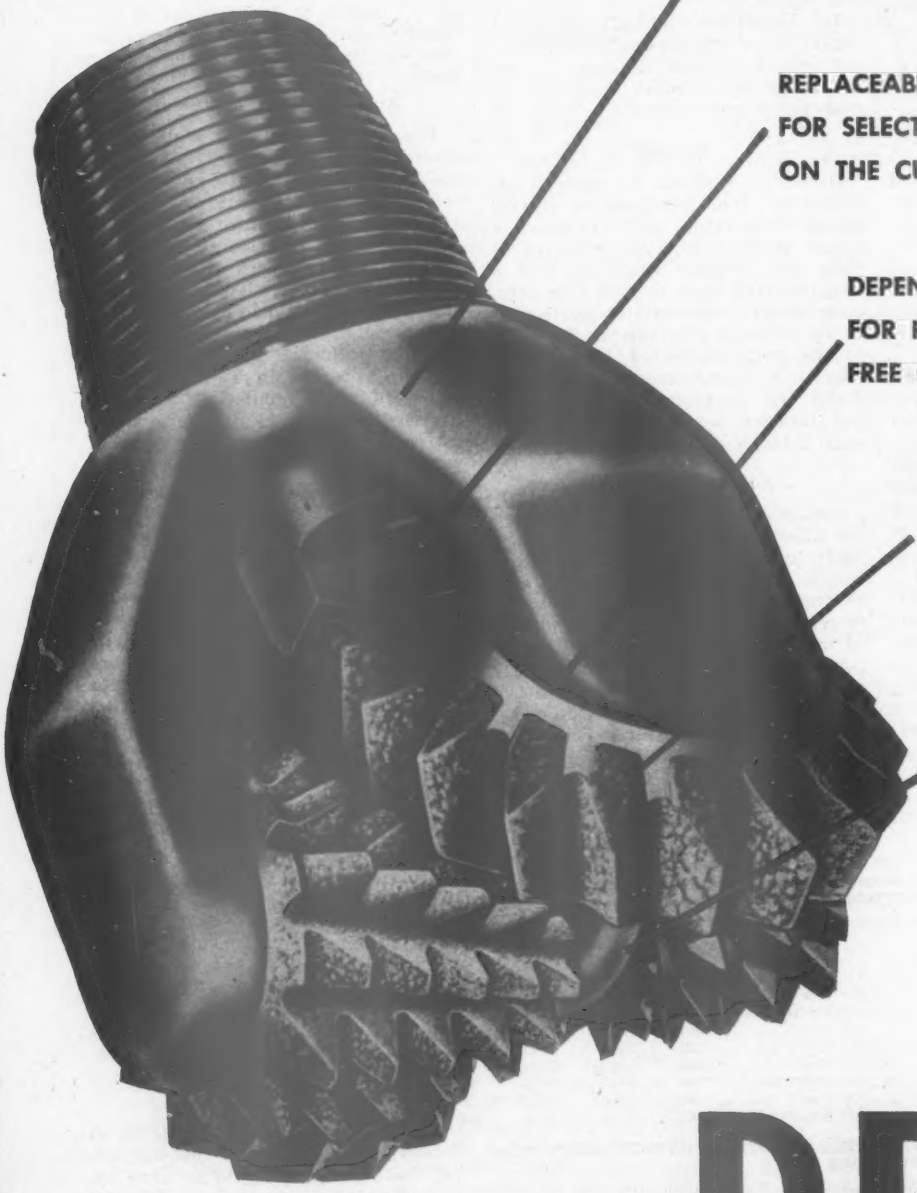
Acid Concentration % HF by wt.	Temperature ° F.	Duration of test, days	Aeration	Corrosion Rate, Inch per Year Cast Monel	"H" Monel	"S" Monel
25	86	6	Air-free	0.0006	0.0004	0.0002
25	86	1	Air-saturated	0.019	0.019	0.009
25	176	6	Air-free	0.0013	0.0004	0.0002
25	176	1	Air-saturated	0.020	0.022	0.021
50	86	6	Air-free	0.0005	0.0002	0.0004
50	86	1	Air-saturated	0.006	0.007	0.003
50	176	6	Air-free	0.0022	0.0009	0.0020
50	176	6	Air-saturated	0.037	0.044	0.046

TABLE 9—CORROSION OF CAST SILICON-MONEL ALLOYS BY HYDROFLUORIC ACID SOLUTIONS

Tests made in closed Nickel autoclove. Quiet exposure. No agitation. Duration of tests: Air-free tests, 6 days; Air-saturated tests, 1 day. Temperature: 176° F.

Per cent Silicon in Monel	Corrosion Rate, Inch per Yer — 25% Hydrofluoric Acid Air-Free	25% Hydrofluoric Acid Air-Saturated	50% Hydrofluoric Acid Air-Free	50% Hydrofluoric Acid Air-Saturated
4.0	0.0016	0.0096	0.0012	0.012
4.69	0.0012	0.0060	0.0011	0.013
5.23	0.0016	0.0060	0.0008	0.013
5.76	0.0014	0.0055	0.0014	0.015
6.61	0.0019	0.0089	0.0012	0.018

Suggestions for more economical



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tests 2 and 3 in Table 2, where high concentrations of HF were involved at temperatures of 235° to 275° F., specimens of both types of silver brazing alloy were embrittled. The lower silver content alloys are reported to be subject to high corrosion rates in anhydrous acid under high-velocity conditions.[5]

Since these brazing alloys are customarily used to join other metals or alloys, the question of their galvanic relationship must be considered in connection with aqueous acid solutions. The galvanic tests between equal areas of Monel and brazing alloys in Table 6, show that the higher silver alloy (RT) is cathodic to Monel while the lower silver alloy (Easy-Flo) is anodic to Monel. Additional galvanic tests between equal areas of Monel and these brazing alloys in 25 per cent hydrofluoric acid at 86° F. and 176° F., both air-free and air-saturated, showed that the RT alloy was invariably cathodic to Monel, while the Easy-Flo alloy was variable in its relationship. From these results it would be concluded that for silver brazing Monel to be used in aqueous acid an alloy of the RT composition should be used to avoid accelerated attack on the brazed joint.

Ni-Resist

The alloy cast iron, Ni-Resist, containing 13.5-17.5 per cent nickel, 5.5-7.5 per cent copper and 1.75-2.5 per cent chromium, is resistant to dilute aqueous hydrofluoric acid solutions at atmospheric temperature but not at elevated temperatures. It was appreciably corroded by commercial 60-65 per cent acid at room temperature. Ni-Resist was reported to suffer severe graphitization in anhydrous acid.[6]

Cast Iron

Plain cast iron has been found to be attacked by hydrofluoric acid throughout a wide range of concentration even at atmospheric temperature, and probably should not be considered a suitable material for use with this acid.

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U. R. Laves, formerly head of the industrial machinery section of the Office of Price Administration, and geologist with several Oklahoma companies, has joined the staff of the production division of the American Petroleum Institute and is stationed at Dallas.

Virgil Smith, recently released Navy lieutenant, has joined Sunray Oil Co. as Seminole district engineer with offices at Allen.

R. K. Paine is the new southern district general superintendent of the pipe line department of Standard Oil Co. of California, succeeding **J. E. Klein** who retired. **C. V. Baxter** replaces Paine as operations control superintendent in San Francisco.

Sheldon Clark, chairman of the executive committee of Sinclair Oil Corp., along with ex-President Herbert Hoover and 11 other civic leaders, was summoned to the White House by President Truman to plan a campaign for public support of a voluntary program of reduced food consumption in the United States.

Roy A. Lind, senior engineer at Shell Oil Co., Inc.'s Wilmington, Calif., refinery, has been advanced to assistant chief engineer.

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3. The Coking of Hydrocarbon Oils

by George Armistead, Jr.

THE coking of various petroleum oil has long been practiced for two principal purposes: (1) To maximize the yield of cracked gasoline, and (2) to reduce residual-fuel production when market conditions were favorable to so doing. In addition, coking of paraffinic residuums was practiced prior to 1930 for the purpose of making lubricating distillates of suitable quality for dewaxing. While most coking operations have operated on residual stocks, the coking of gas oil has been done commercially to a limited extent at times to increase gasoline yield or dispose of certain stocks. The recent widespread expansion of catalytic cracking has indicated an important new stimulus toward increased coking of residuals for supply of catalytic-cracking feed stock. This has been pointed out by Noll and Bowles in their recent study of catalytic cracking economics[1] and in a recent issue of the Kelloggram.[2] It is generally true that equipment adapted to coking is readily convertible to the production of liquid residue, and to that extent refineries equipped for coking have a very desirable flexibility to meet changing market demand. Nevertheless, the cost of the equipment peculiar to the coking operation must be justified by its use in that service. The present-day use of coking is associated mainly with the production of cracked gasoline from residuums and it is the object herein to review the processes and other factors bearing on the utility of coking in the refinery.

Types of Processes

The established thermal coking processes fall generally within two classes, as follows:

1. Processes for ultimate gasoline yield, in which complete cracking of the gas oil evolved in the coking is accomplished as an integral part of the coking operation.

2. Processes for partial gasoline yield, in which residual or distillate stock is coked, to produce a relatively small yield of gasoline and a gas oil which can be subsequently cracked in a separate thermal or catalytic operation.

In addition to the thermal processes, there may be said to be a corresponding process phase of catalytic cracking. In the charging of stocks direct to the catalyst as a liquid, a somewhat similar effect to that in the second-mentioned thermal process above results from the residual heat in the catalyst, which instantaneously raises the oil to 850° F. or above. Coke is left on the catalyst, and the vaporized gas oil thereafter continues to undergo cracking with the deposition of additional coke. Processes for catalytic cracking of liquid residual stocks, both with and without previous deasphalting have been recently announced by workers on the Fluid and Thermofor processes,[3,4,5,6] but insofar as is known, the processes have been practiced commercially to a somewhat limited extent. It is apparent, however, that this feature of catalytic cracking, when established commercially may supplant to a considerable degree the functions of the thermal-coking processes. It is generally considered necessary in commercial operations to thoroughly clean such liquid feed stocks of salts and other inorganic material which would contaminate the catalyst and propane deasphalting is one of the means to this end.

THE delayed coking process has advantages for producing charge stocks for catalytic crackers, competitive with propane deasphalting. Delayed coking is one important process for conserving petroleum to give maximum ultimate yields of motor fuel by both catalytic and thermal processes. It is also a good means for disposing of fuel oils and heavy residues when market conditions for them are unfavorable. It is competitive with viscosity-breaking and cracking, with higher yields.

Ultimate Yield Operation

The ultimate yield type of coking operation of which the deFlorez process is an example, is illustrated in Fig. 3-1. Fresh feed, which may range from gas oil to heavy cracked tars is introduced into the primary fractionator where some distillation of it occurs, and a residue is collected in the tower base for introduction to the coke drum. Heater feed is condensed in the secondary fractionation zone, comprising unconverted recycle stock and the distillate from the feed in the primary tower. This is passed through the heater under pressures ranging up to, but usually considerably lower than 500 lb. on the outlet, and temperatures up to 1,100° F. The heater discharge then combines with the primary fractionator bottoms either in the transfer line entering the coke chamber, or the two streams enter separately and mix within. In the coke chamber vapors pass overhead and the residual liquid, maintained at 800°-875° F. temperature goes to coke. Coking-chamber pressure is usually maintained from 25-150 lbs. The conversion per pass to gasoline, based on heater feed, ranges up to approximately 25 per cent, although such conversion includes also the gasoline formed in the coking chamber from the primary fractionator bottoms in cracking to coke. Two or more coking chambers are used alternately, the number depending upon the time required to fill with coke, which in

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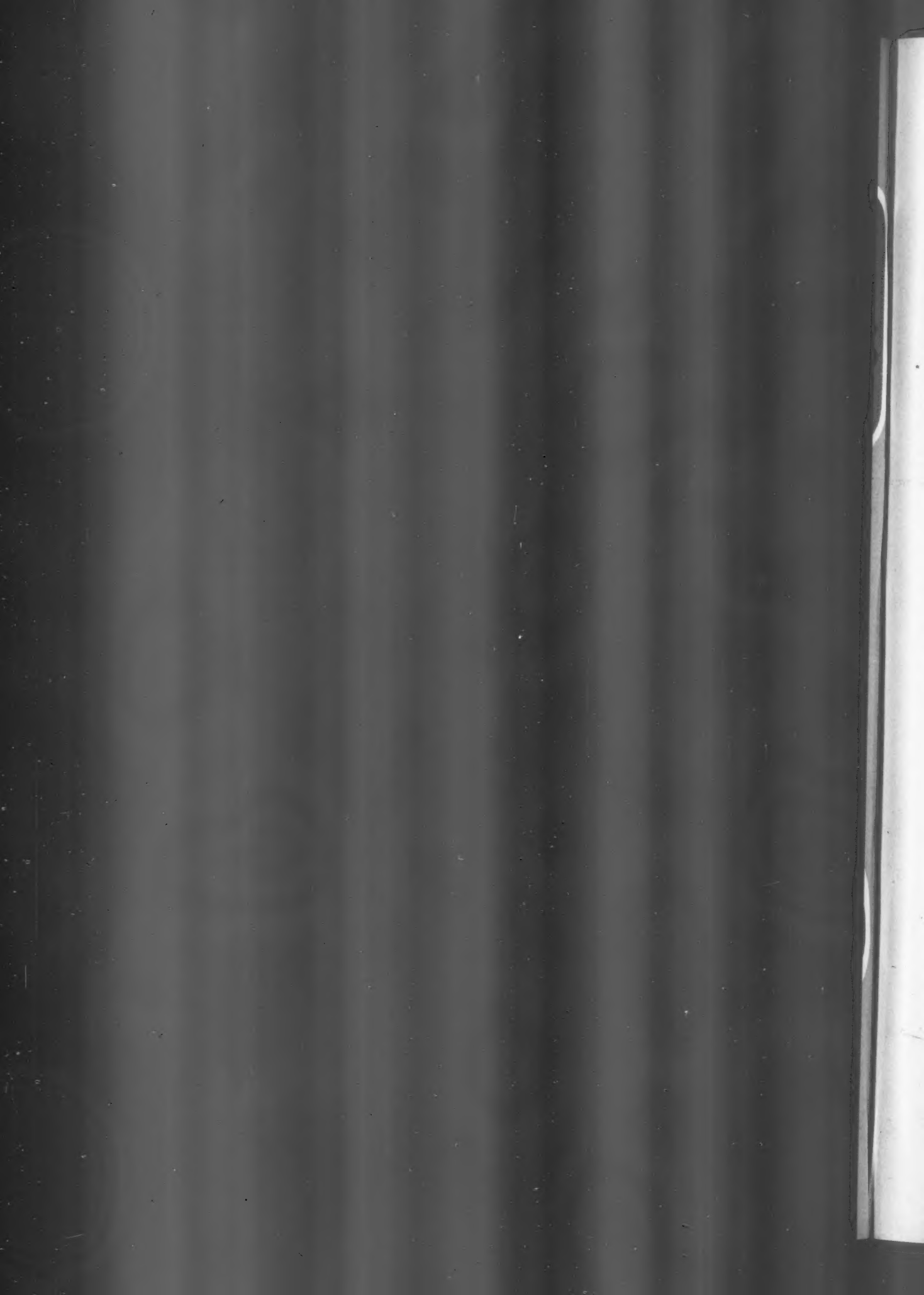

turn is determined by the feed rate and coke production per barrel of feed. In some cases a reaction chamber is provided between the light-oil heater and the coking chamber, and a heater may be provided for the heavy-oil feed to the coking chamber. The products from this operation are motor gasoline, gas, and coke.

Fig. 3-2 shows the yields of 400 e.p. gasoline, coke, and gas obtainable from feed stocks of various gravities by the ultimate yield coking method. It will be noted that data in this figure extend from the very-low-gravity feed stocks in the cracked-tar range up to the light feed stocks which are distillate gas oils. In the lower gravities it is apparent that the very low yields of gasoline and high yields of gas and coke make such an operation very difficult to justify economically, even as a disposal means for excess heavy tars. With higher-gravity feeds, the gasoline yield rapidly increases while there is a corresponding decrease in coke yield. It will be seen, however, that the gas yield goes through a minimum at about 18°-20° A.P.I. and thereafter increases. In the lower gravity A.P.I. range, very-high-molecular-weight hydrocarbons are being decomposed with their characteristic resultant yields of predominantly gas and coke. As gravity rises, this effect diminishes rather rapidly and at the same time gasoline yield increases with its accompanying gas production, the latter increase in gas, however, not keeping pace with the first-mentioned decrease and the net result is a decrease in gas yield to about 18°-20° A.P.I. feed. Past this point, gasoline yield increases more slowly with gravity (° A.P.I.) increase and the gas yield basis feed increases. An interesting phase of this effect is shown in the following tabulation comparing total gas and coke production at different gravities of feed with the gasoline yield:

Feed ° A.P.I.	Wt. % Gas + Coke / Wt. % 400 e.p. Gasoline
4	3.4
10	1.6
18	0.9
24	0.8
30	0.65

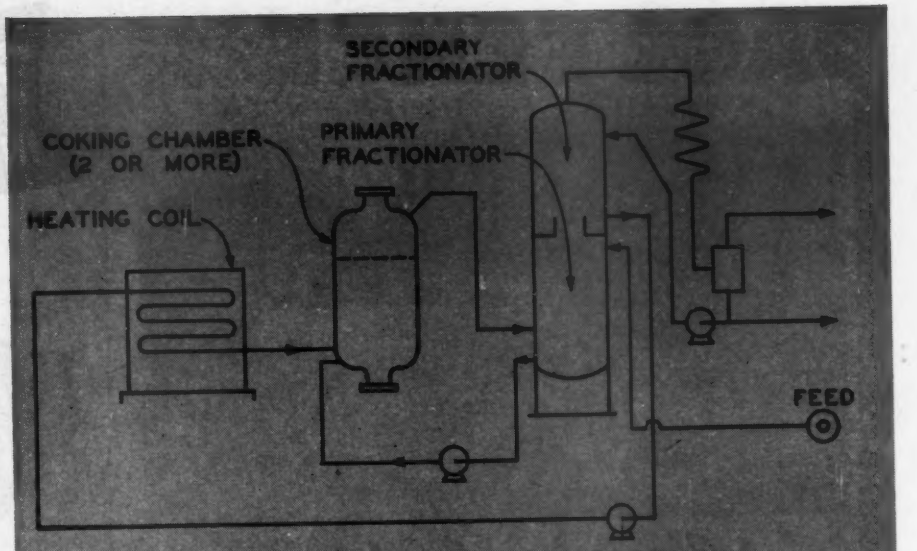

Fig. 3-1—Ultimate recycle coking process

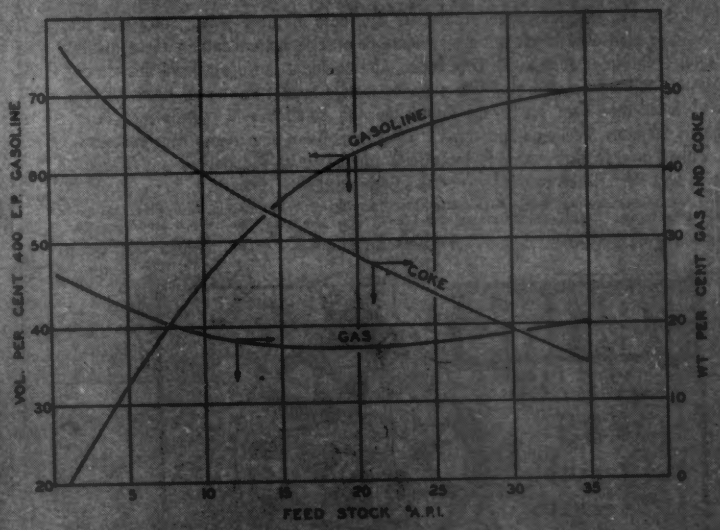

Fig. 3-2—Yields from ultimate yield coking operation

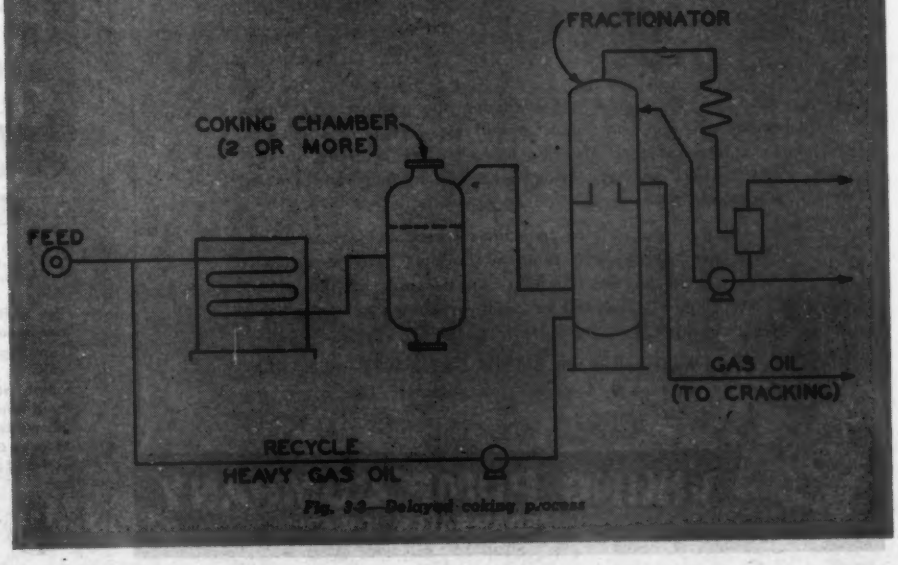

Fig. 3-3—Delayed coking process

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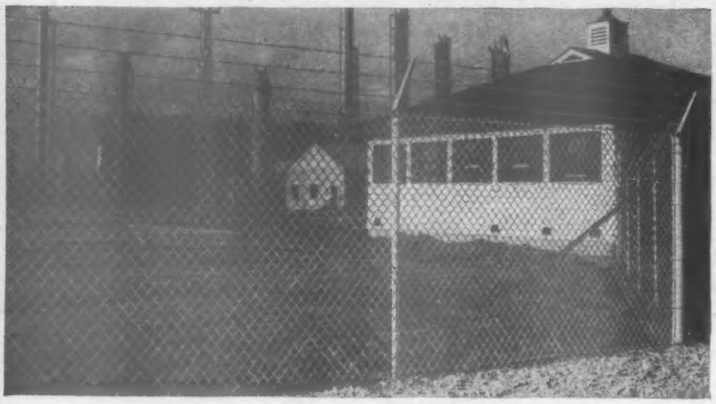

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Fig. 3-2 does not take into consideration fundamental differences in feed stocks other than A.P.I. gravity, which are known to affect the yield shown, such as characterization factor, or whether the stock is of virgin or cracked origin, nor does it include the effect of operating conditions. Increase in crack per pass decreases gasoline yield and increases the gas yield appreciably. Increase in feed characterization factor (U.O.P. "K") tends to increase cracked gasoline yield and to decrease coke and gas yields. It is felt that the accuracy of Fig. 3-2 is in the average range of ±3-4 per cent with possibly greater differences in isolated instances.

Yield of gasoline will, of course, be reduced by the withdrawal of cycle oil from the system, which has been generally discussed by Watson [11] who showed the effect of so doing in different cracking and coking circuits.

The octane-blending qualities of the coking-unit gasolines are more dependent on characterization factor of the feed than on its gravity, and the more cyclic, low-characterization-factor materials gives A.S.T.M. octanes ranging up to 78, while the more paraffinic materials are in the range of 65 to 70. Here again operating conditions also have appreciable effect, increases in crack per pass and temperature both causing increase in octane number of the motor gasoline.

Delayed Coking Process

Fig. 3-3 is a flow diagram of a coking unit for coking residuals and heavy distillates to partial yields of gasoline, with production of gas oil for feed to thermal or catalytic cracking. This process is generally termed the delayed coking process when employed on virgin residual feed, and was described generally by Diwoky [4] in 1938 and an application of it later by Ziegenhain.[6] Watson[11] has described the application of a similar circuit for coking cracked residuum. In this simple process, the feed after initial preheat is passed through a heating coil where it is heated to 900°-950° F., and discharged into the coking chamber. In this vessel, the unvaporized portion goes to coke and the evolved vapors, along with the vapors formed in the coil, pass into the fractionator. It is necessary that the heating coil be of such design as to effect a rapid heating at minimum soaking time, to minimize cracking before entry to the chamber which would result in coil coking. The coking chambers operate under pressures from 5 to 50 lb. and at temperatures of 775°-850° F. As indicated in Fig. 3, recycling of the heavier fraction of the gas oil production can be practiced, with the results discussed later. In this process, as in that previously described, two or more coking chambers are used alternately. The number and the time to fill, as in the other case, depend upon the rate and character of feed. Due to the greater desirability of lower pressures in this process as compared to the recycling ultimate yield type, the coking chambers may be of lower wall thickness, and it is consequently possible to construct them in sizes up to 16 ft. or more in diameter. A 16-ft. chamber with 30-ft. permissible filling height will accommodate approximately 150 tons of coke, of 0.8 sp. gr.

Generally this process is employed for the coking of virgin stocks with the gas oil delivered to thermal or catalytic - cracking charge stock. In some cases, however, it may be charged with the heavy cracked tar from a thermal-cracking unit, under about the same conditions described above, with the gas - oil production being returned to the cracking cycle, if desired, or drawn off as a product.

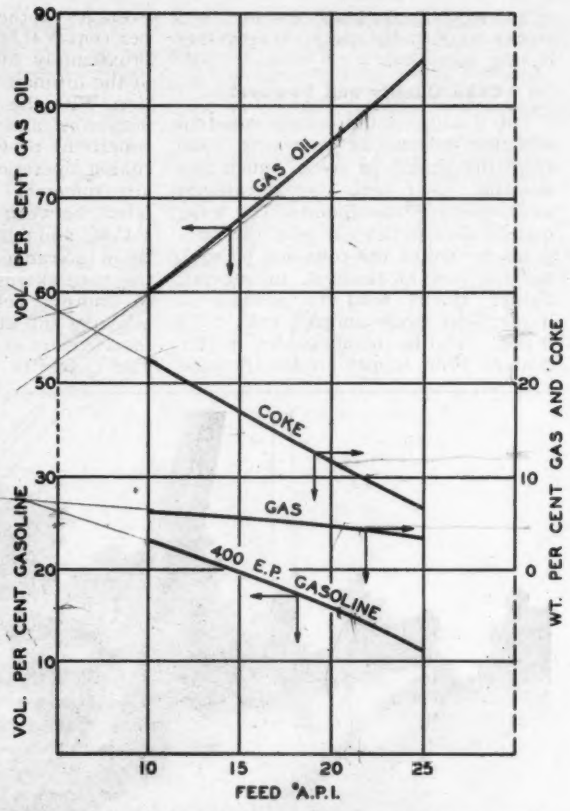

Fig. 3-4—Trend of yields from coking paraffinic topped crude

Typical yield relationships for the once-through coking of topped crudes to partial yield by the delayed coking process are shown in Fig. 3-4. It will be noted that, as would be expected, gas-oil yields increase rapidly with increasing A.P.I. gravity, while yields of gasoline, coke, and gas decrease at the same time. These effects proceed in this direction as the feed stock approaches a volatility at which complete vaporization would be possible at coking - chamber conditions, at which limit there would be approximately 100 per cent gas oil (including incidentally cracked gasoline) yield and no important yield of the other products.

High Boiling Range

The coker gas oils from the once-through operation whose yields are shown in Fig. 3-4 are of relatively high boiling range, with end points generally above 900°. The heavier fractions are important for catalytic-cracking feed particularly, since they comprise materials which give much less favorable thermal cracking results due to the large production of tar and gas. It has been shown [9] that the use of delayed coking makes available more of the crude for catalytic cracking than does viscosity breaking, the increase being about 3 per cent in the case of East Texas crude, for example. This is, of course, due to the distillation of the heavy fractions in the coking process, a portion of which are broken down to coke, gas, and gasoline in the process. In the event a lighter-boiling-range total coker gas oil is desired, recycling of the heaviest gas oil above 860°, for example, may be carried out, wherein the decomposition of these fractions is extended, with the production of more gas and coke and a lighter over-all gas oil. Recycling has been useful in preparing feed for high - pressure thermal-cracking coils and gives appreciably increased over-all gasoline yield from the combination coking and thermal cracking operation. Optimum recycle ratios for coking have been found in some cases to be in the range of 1.2 to 1.6.

The yield data in Fig. 3-4, as noted, is for virgin stocks and does not extend down into the gravity range of thermal cracking unit tars that are coked by similar methods, such as that mentioned by Court [3]. The lower-gravity cracked feed stocks give proportionately lower gas-oil yields, and at the same time the percentage of gasoline is lower. The gas oil, in addition, is of a highly refractory character, from which relatively low ultimate yields of gasoline are obtainable. This naturally makes the coking of such stocks unattractive economically, except as a disposal means for liquid fuel oil, similar to the situation noted

in connection with heavy cracked feed stocks for the ultimate yield recycling coking operation.

Coke Quality and Removal

The quality of the coke production and the means for removing coke from the chambers are of much importance from both the operational and economic standpoints. The coke quality determines not only the purposes for which the coke can be sold, but the ease of removal. In general, lighter stocks tend to produce a harder and more compact coke with lower volatile combustible matter content. From topped crudes, the coke averages in the neighborhood of 7-10 per cent V.C.M. and a density of approximately 1.0 under the conditions of the ultimate yield recycling operation. With the somewhat lower temperatures and other differences in conditions prevailing in the delayed coking operation, the coke is generally somewhat softer, can be regulated between 7 and 11 per cent V.C.M.[8] and may have a specific gravity in the range of 0.6 to 0.9. One practice used extensively in this operation to improve coke quality consists of allowing full coke chambers to stand for 24 hours or more before cleaning. The character of coke varies somewhat throughout any given chamber and considerable variations between chambers are possible with the variation of operating conditions.

The removing of coke from the chambers generally involves a substantial item of investment cost or continuing operating expense, or both. Coking chambers are usually filled to within 10 ft. or less from the top, depending upon the entrainment characteristics, vapor velocity, tendency to foam, and other conditions prevailing in the vessel. The time of running into and filling a chamber may be as low as 6 hours and as high as 36, the typical units referred to by Court [2] and Diwoky,[1] employing 9 hours and 36 hours, respectively. The removal of the coke mass is in all cases effected through the lower manway of the vertical chamber which may be between 2 and 6 ft. in diameter. The two most prevalent methods for coke removal are the cable and hydraulic methods with the vertical drilling method used to a lesser extent. The former, which has been used since the earliest coking operations, consists in coiling approximately ⅞-in. stranded steel cable in the chamber from top to bottom, suspended on light soft iron wires. This is a laborious task, requiring about 4,000 ft. of cable for a chamber holding about 125 tons of coke. After filling the chamber with coke, the cable is pulled through the bottom manway by means of a hoist, dislodging the coke as it comes. The coke contains most of the small wire used for holding the cable in place, which can be most objectionable. This method tends to minimum breeze production and may, for example, average about 60 per cent above ½-in. size.

The hydraulic method of coke removal is now in general use on the larger coking units throughout the industry. As described in some detail by Court [2] this method consists essentially in the cutting out of the coke mass by high-velocity water streams from nozzles lowered through a bit-drilled hole in the mass, the dislodged coke fragments passing out through the bottom manway with the water, which later passes into a recovery system for separation of the fines or breeze which is carried in suspension, from which the water passes back to the high-pressure jet pumps for reuse. While the investment required for the removal of coke by the hydraulic method is considerable, the speed of removal of coke is high and the removal costs are minimized. The actual time of cutting out the 150 tons of coke from one chamber is in the neighborhood of 1½ to 2 hours, or approximately half that with the cable method. The hydraulic method has the further advantage of making good production of marketable lump coke free from contamination. This method was developed through the joint efforts of Shell Oil Co., Inc.,

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The third of the removal methods is the vertical drill method developed by Hughes Tool Co. This method employs a hydraulically controlled rotating drill stem from a well below the drum manway, which, after opening a passage through the mass, dislodges the main body of the coke by the impact and scraping of swinging weights. There is a tendency with this method for greater production of breeze than by the other two mentioned methods, but studies indicate it to be cheaper in direct costs than the cable method.

Several other variations of the partial-yield type of coking have been used to a limited extent in the past, the most important of which involved the addition of heat to the oil undergoing coking through the wall of its containing vessel. Included in these were: (1) the use of conventional cylindrical shell stills equipped with large end manways; (2) the refractory Knowles coking furnace equipped with mechanical coke removal means,[12] and (3) a moving-belt continuous-coking process described by Jones.[13,14] The Knowles process, comprising batteries of refractory ovens in which the oil was coked and later removed by a mechanical ram, was used to an appreciable commercial extent for the coking of heavy feed stocks including some heavy cracked tars. Its yields were indicated to be of the same general order as those from delayed coking of similar stocks.

The future utility of coking in the refining industry will be influenced by many factors. Coking, in one aspect, is competitive with viscosity breaking, and the incremental yield possible by coking followed by cracking must justify the additional expenditure. A comparison of the relative yields from viscosity breaking and thermal cracking with coking and thermal cracking, was shown by Read and Egloff[10] for Arabian topped crudes and is typical of other stocks such as Mid-Continent crude. Thus:

	Vol. % 400 e.p. Gasoline	
Topped Crude ° A.P.I.	Visc. Brkg. and Cracking	Coking and Cracking
17	33.1	61.4
28	56.1	70.3

Such figures indicate that the advantage of coking may be greater where heavier stocks are charged, which would favor its justification under good heating oil, tractor distillate, etc., marketing conditions tending to leave only heavier fractions above a certain middle distillate yield. The advent of catalytic cracking has increased the importance of the partial yield or delayed coking operation as a feed preparation process although it has as a competitor the deasphalting process for the same purpose.

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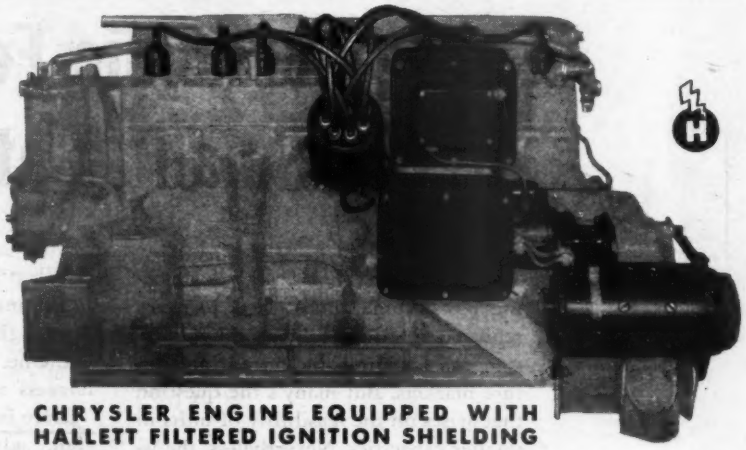

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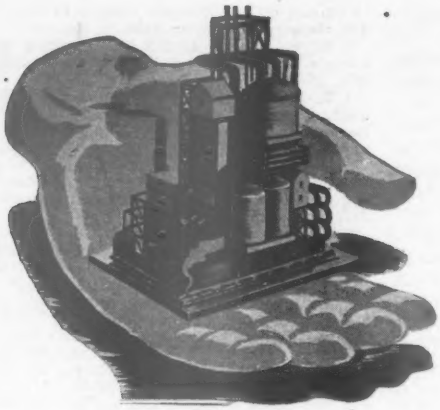
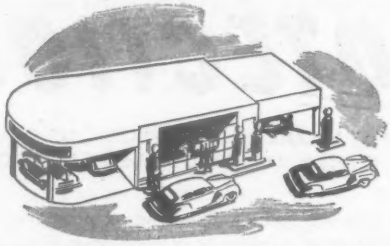


The Economic Feasibility of the Small "Cat-Cracker"

TODAY, of course, *Fluid* catalytic-cracking has become almost vital to every refiner determined to meet the quality standards required by current and future markets. But many's the question that arises on the feasibility of units in smaller capacities. Nevertheless, the issue must be resolved by refiners with a crude throughput even as small as 3000 to 5000 BPD.



For if no immediate capital investment is contemplated for a *Fluid* unit, there's every indication that the refiner has but these alternatives: 1. Make no attempt to meet competition on a quality basis; or, 2. Attempt to match competition via costly blending. As a temporary expedient, this latter can prove satisfactory, but it holds little promise over the long haul.

When the subject of investing in a *Fluid* unit is investigated, two schools of thought become immediately apparent. One, which we must dismiss in all fairness to the Kellogg philosophy of "There is no substitute for the best design," advocates the purchase of some form of catalytic-cracking at lowest initial cost available. The second measures the true economic worth of a *Fluid* unit — regardless of size — by its earning power. And this is the yardstick of the Kellogg approach to process design.

To the refiner who desires a *Fluid* unit with a capacity as small as 1,700 BPD... Kellogg can deliver designs that will match the biggest units it has built in quality of product and dependability of operation. While these two performance conditions are essential, ultimate earning power depends as well on other factors such as crude supply, market for products and the local competitive situation. Because these conditions differ so radically in various localities—and even within the same localities at different times—there is no one design, no single set of engineering principles against which a proposed unit may be

QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Diesel Fuel Additives

Are materials similar to tetraethyl lead and top-cylinder lubricants added to diesel fuel oils?—D.V.

Although the performance characteristics of diesel fuels have become more and more exacting, so far these demands have been met largely by straight petroleum products. Materials similar to tetraethyl lead have been proposed but have not yet found favor.

In the January 1946 issue of Chemical & Engineering News, published by American Chemical Society, is a short item (page 1358) about the manufacture of a lubricant-type additive for diesel fuels. The diesel-fuel-oil concentrate is said to prevent sticking and corroding of injector nozzles, provide top-cylinder lubrication, and to prevent the formation of hard carbon and sticking rings. It is manufactured from light mineral oil and will mix with ordinary diesel fuel oil without agitation.

Cold Starting of Diesel Fuels

What is needed in a diesel fuel oil to cause easy starting? We have lots of trouble with starting during the winter.—H.A.L.

Starting at low temperatures is such a common difficulty that various artificial means of starting have been employed. Among these are heating coils for the fuel, so-called "hot-spots," the use of kerosene for starting the engine, and even the addition of diethyl ether (Shoemaker & Gadebusch, Effect of Fuel Properties on Diesel-Engine Performance, The Oil and Gas Journal, January 12, 1946, page 74).

With respect to properties of the fuel oil, it should not be too viscous to pump, it should not contain wax that will congeal, and it should ignite properly at the low compression temperatures encountered when operating on cold air. If the fuel is more viscous than 550 seconds Saybolt Universal viscosity at the starting temperature, some fuel-injection pumps will not operate properly. Thus, the viscosity of the fuel must not exceed:

Starting Temp. (°F.)	Max. viscosity, sec. Saybolt Univ. @ 100° F.
—20	42
0	50
20	65
40	98
60	160

Fuels of even the above viscosities are not satisfactory if the pourpoint of the fuel is high. In general, plugging of screens or cloth filters tends to occur at a temperature about 10° F. above the pourpoint because of small amounts of wax (haze or cloud of wax) and hence:

Starting Temp. (°F.)	Maximum pourpoint (°F.)
—20	—30
0	—10
20	10
40	30

Finally, the fuel must exhibit a good ignition quality even if the viscosity and pourpoint are satisfactory. Shoemaker & Gadebusch of General Motors Corp. report that the cetane number must be as follows if starting is to be easily effected:

Air Temp. (°F.)	Cetane number
—20	90
—10	83
0	76
10	69
20	63
30	56
40	49
50	43
60	36

Naphthenic and cracked fuels have low pourpoints, they are not too viscous but their cetane numbers seldom exceed 50. Paraffinic fuels have higher cetane numbers but in order to exhibit pourpoints of —10 or —30 the viscosity must be kept down to about 35 seconds or less.

References to Oil Additives

We are contemplating going into the oil-additive business. Will you please send me any information that you may have on hand or information in the form of pamphlets, bulletins, reference books, etc.?—J.K.G.

The literature on oil additives is now so voluminous that recourse must be had to organized lists such as the Chemical Abstracts of the American Chemical Society, the Patent Gazette, etc. Nevertheless, the following are Questions on Technology discussions which pertain to additives or closely related materials:

Identification of Oil Additives, March 27, 1941, p. 208.

Paratone and Other Oil Additives, July 30, 1942, p. 168.

Additives for Increasing Viscosity Index, October 15, 1942, p. 50.

Reducing Pour Point with Depressants, December 30, 1944, p. 267.

Identification of Additives,—also Launderometer Test for Diesel Oils, November 18, 1943, p. 49.

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Device Expedites Removal Of Old Pipe Lines

by Paul Reed

Here is described a novel device which accelerates removal of pipe from a buried line after it has been uncovered by a ditcher. A tractor pulls the equipment, which is easily made.

THE advantages of a new device for increasing the effectiveness of pipe-removal operations have been recently tested by H. C. Price Co. which developed the equipment. The project on which this device attracted particular attention was the reconditioning of a Shell Pipe Line Corp. 30-mile section of 10-in. pipe between Cushing, Okla., and the Arkansas River near Cleveland, Okla.

All of the pipe was dug up, removed to a yard for double-jointing, coating, and wrapping. The work was planned so that there were only three interruptions during the job. Altogether 12 miles of new pipe was added. The procedure was to lay 9 miles of new pipe. The remaining 3 miles of new pipe was later used for replacing discarded joints removed in the course of the project. After laying the 9 miles of new pipe, this section was tied into the existing line and the old pipe of that section was removed from the ground.

The purpose of the new device is to accelerate removal of pipe from a buried line after it has been uncovered by a ditcher. The equipment consists of two long split nipples of pipe of considerably larger diameter than the pipe to be removed. The forward nipple is shorter than the rear nipple. The two nipples are joined by a hinged connection. The equipment is fastened to a tractor by means of a clevis attached to a cross bar on arms at the forward end.

As the equipment is pulled along the pipe is pried up from the ditch. By this method pipe can be removed from the ground much faster than by the usual practices.

Views of special device for pulling pipe from ditch during removal operations

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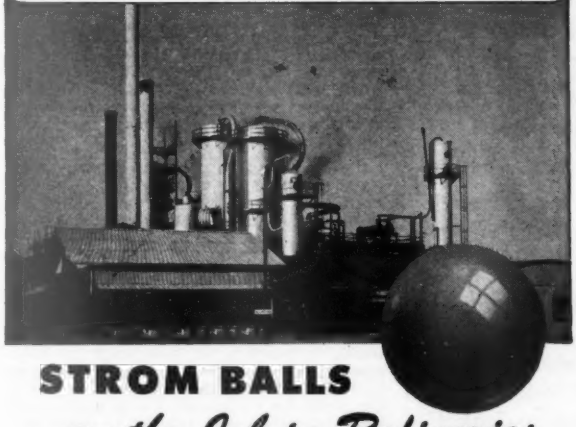

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BOOKS

HACKH'S CHEMICAL DICTIONARY. Third Edition. By Julius Grant. The Blakiston Co., Philadelphia. 925 pp., $8.50.

This third edition of the dictionary was edited and revised under the direction of Julius Grant, following the death of its original author and editor, Ingo W. D. Hackh. The volume contains more than 57,000 terms and their definitions. Biographies of all prominent chemists and scientists are included also, together with the discoveries for which they are famed. The work looks especially to balance in treatment of definitions between American and British viewpoints, stating in the preface that "in a postwar world every line of approach to community of thought between the English-speaking nations has an added significance." Pronunciations have been omitted from this text, giving additional space which is used for inclusion of new material. Especially is attention given to the most recent developments in atomic disintegration.

As in the second edition the simplified spelling of many words has been adopted as being the preferred form. The editor answers the protest of those speaking against this simplification, such as "sulfur" instead of "sulphur" by asking what "defence" they offer for modernizing the spelling of "oeconomy, gangraene, aether, aeternal, paenalty" and other words from which the diphthong has long been omitted. Hackh outlines his position in this field by stating that "the good work of simplification will continue, regardless of the Greco-Latinists who, enmantled in their academic environment, are becoming ghostly in the gloom of desuetude." A large number of chemists, physicists, and scientists in the chemical and collateral science fields have collaborated in revision of the work.

CATALYTIC CHEMISTRY. By Henry William Lohse. Chemical Publishing Co., Inc., Brooklyn. 471 pp., $8.50.

Fulfilling at least in part the demand for assembled knowledge on catalytic chemistry, this work, after a brief discussion of the history of the field of catalysis back to Sabatier and earlier, presents in four chapters the major types and kinds of catalytic reactions, the theory of catalysis, catalysts, and their properties and industrial catalytic reactions, of present and possibly future interest. Our estimates of purity of materials are relative, the author indicates; even in extremely pure materials many impurities are found in extremely small percentages, by spectroscopic and other methods. Thus the presence of these impurities and their probable catalytic effects are the basis for possible explanations. The purposes of catalyst promoters are discussed in some detail. Under Industrial Catalytic Reactions the synthesis of ammonia, and production of nitric acid therefrom; acetylene derivatives; natural gas and production of alcohols; cracking and hydrogenation of tars and oils; production of motor fuels by low and high pressure destructive hydrogenation of hydrocarbons; catalytic cracking and polymerization, reforming, alkylation, and the synthesis of rubber are some of the processes and reactions discussed.

REPORT ON BEHAVIOR OF FERRITIC STEELS AT LOW TEMPERATURES. Made available by American Society of Testing Materials, 260 Broad Street, Philadelphia. 212 pp. $4.

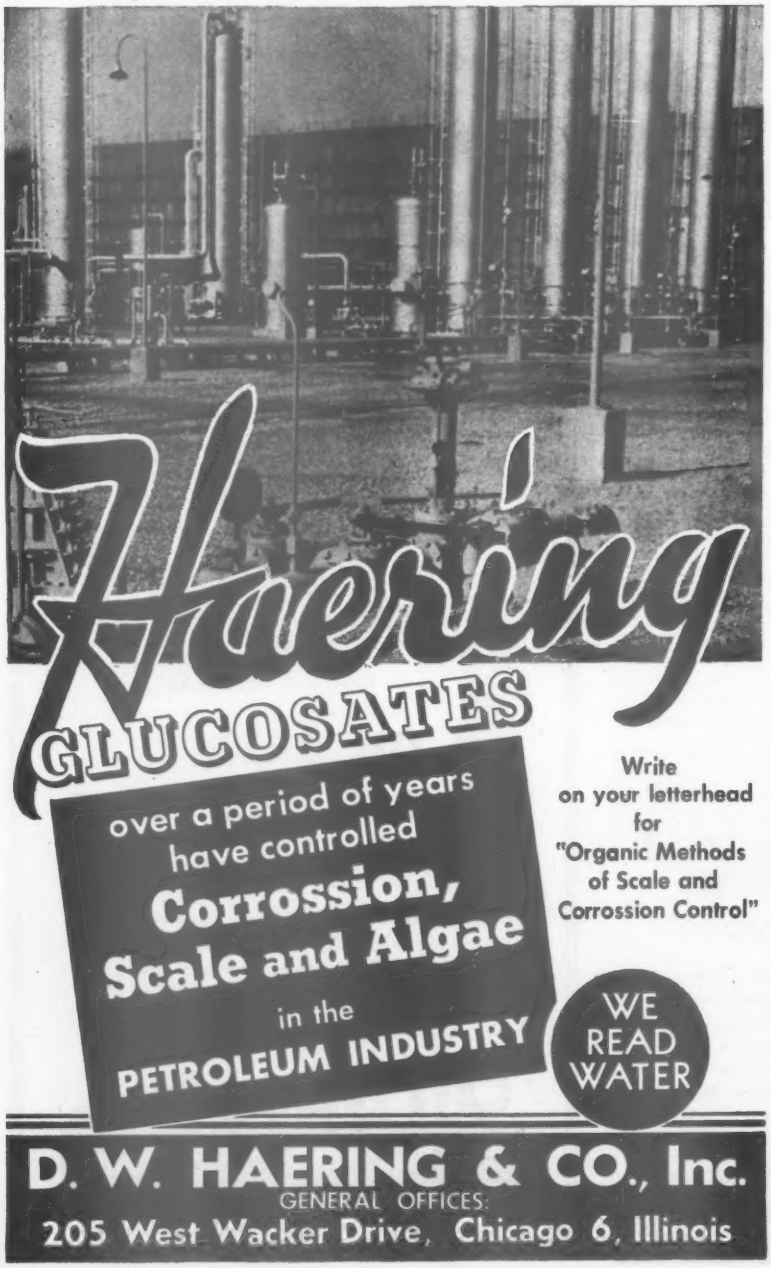
This report, issued in two parts, covers the extensive data resulting from experimental work carried out at University of Kentucky as a war metallurgy committee project, but there are many data from other sources. Prepared by Dr. H. W. Gillett, Battelle Memorial, Institute, and Francis T. McGuire, University of Kentucky, there is first an extensive discussion of the project, the materials included, and the resulting data. Part 2, the larger portion of the report, gives the data developed with a large number of figures and charts. The work was intended to secure a comprehensive set of data on the low-temperature behavior of commercial, national-emergency, S.A.E., and similar steels.

PETROLEUM AT WAR. Published by The Petroleum Times, Brettenham House, Lancaster Place, Strand, London, England. New York Office, 545 Fifth Avenue.

This is a reprint from The Petroleum Times, and it recounts how Britain mobilized its oil resources to pursue the war. Principally, it describes the evolution and history of the petroleum board, and how it works. It tells how oil men faced the blitz, how the civilian silent service operated, how civilians fueled the forces, and how the problems of transport and distribution were overcome. The reprint is being distributed to every one of the employes of the different oil companies forming part of the pool.

DICTIONARY OF ENGINEERING AND MACHINE SHOP TERMS. By A. H. Sandy. Chemical Publishing Co., Inc., Brooklyn. 153 pp. $2.75.

Compiled in this handy volume are the definitions of many important terms used in machine shops, industries, and engineering literature, as gathered by the author during many years of experience both in industry and as a lecturer. In clear and simple language, the book will be useful not only to engineers and students of engineering, but also to foremen and specialized workmen of the various shops and industries.



Engineering Fundamentals

No. 226

A FEATURE OF THE OIL AND GAS JOURNAL

Feather-Edge-Porosity Reservoirs

NUMEROUS permeability traps are due to change in texture or sorting of grains making up a reservoir bed, or to change in lithology, or to influence of cementation or solution. The effects of these phenomena are not sharply separable and are combined in some cases to form a trap. However, in all cases they display about the same manner of a more or less abrupt lateral change in porosity. The term "feather edge" porosity is commonly used in this connection and the name "Feather-Edge-Porosity Reservoirs" may be used to denote the family whose traps are caused by the foregoing conditions.

1. Feather-edge-porosity reservoirs in sands.—The lithological change from sand to shale, clay, or silt, accompanied by a change from sandy texture to fine clay or silt texture, is the cause of the most common permeability traps. The sands grade into zones where particles of clay or silt fill the voids between the sand grains or even where a coarse sand grades into one of very fine texture. The conditions are then described as: shaling-out, silting-up, fingering-out, lensing-out, pinching-out, or gradation into argillaceous or silty sand. However, in this case the term "pinching-out" is used to denote the gradation from permeability to impermeability and not the actual disappearance of the reservoir bed.

The most typical feather-edge-porosity conditions in sands are found in beds which originated under marginal marine sedimentation, such as delta and shoreline deposits. The Texas-Louisiana Gulf Coast offers numerous examples of reservoirs in beds formed in stratigraphic environments of this nature, for example, University field, Louisiana, and the Lopez field in Texas.

In limy sand zones, cementation of sands is rather general. The degree of cementation may increase laterally and reduce the permeability to the point of a permeability trap, and feather-edge-porosity reservoirs due to this cause are not uncommon. Otherwise, this trapping effect is in many cases an incidental factor. The cementing material is ordinarily calcareous, rarely siliceous. Anhydrite is also encountered as cementing agent, for example, in the Permian sands of West Texas and New Mexico.

2. Feather - edge - porosity reservoirs in limestones. — Limestones with any type of porosity are apt to give rise to feather - edge - porosity reservoirs with traps produced by lateral gradation from porous and nonporous limestones, for example, Noodle Creek, Texas, and the Hugoton gas field, Kansas-Oklahoma.

The reasons for traps are numerous, such as: (1) Change from granular, oolitic, or fragmental to dense crystalline texture; (2) boundaries of solution action; (3) lithologic change from porous limestone to tight sandy limestone, or from porous dolomitic limestone to dense calcitic limestone, or from porous limestone to anhydrite, and (4) secondary cementation of porous zones by calcite or anhydrite.

Reservoirs with Asphaltic Seals

Many permeability traps are formed by impregnation of the reservoir bed with asphalt or solid hydrocarbons which seal off porosity. At least one major oil field is due to this type of trap, namely, East Coalinga, in the San Joaquin Valley of California. The field is located on a structural nose with the outcrop of the producing Temblor sands a short distance updip from the productive area. The structure is thus open, and the oil reservoir is mainly protected by some heavy residual oil and asphalt which impregnated the sand between the reservoir and the outcrop. However, a stationary oil-water contact suggests that the edge water had reached a level of equilibrium due to regional hydrostatic conditions. This is probably the principal reason why the large Coalinga reservoir could maintain itself under the weak protection of an asphaltic seal.

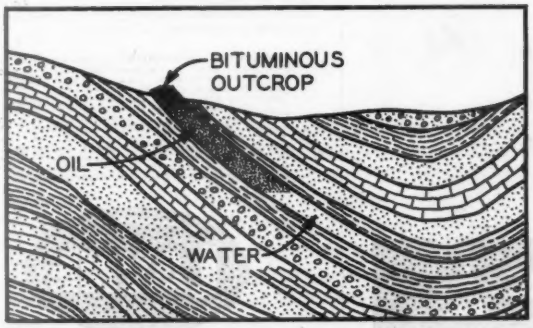


Fig. 1—Reservoir with asphaltic seal

Many less important accumulations of heavy oil are trapped by impregnation of residual asphalt at or near outcrops of structurally open reservoir beds. Cakes of asphalt deposited from petroleum that seeped to the surface or asphalt impregnation in the reservoir bed below the outcrop trapped the oil which followed. Such reservoirs occur particularly in strongly tilted beds in the eroded cores of steel anticlinal uplifts, or on their flanks. Fig. 1 illustrates a typical reservoir protected by an asphaltic seal.

Reservoirs in Zones of Fracture

In hard limestone, sandstone, chert, or siliceous shale, fracturing may open a network of fissures and thereby produce a porous and permeable rock which can serve as reservoir rock. If the fissuring is general and extensive, as, for instance, in folded limestone, the resulting reservoir rock may lend itself for simple convex trap reservoirs, for example, in Iranian oil fields. Exceptionally, fractured siliceous shale or chert is found as reservoir rock in strongly folded anticlines, for example, Spellacy anticline, Midway field, California. On the other hand, where fissuring and accompanying permeability are restricted to certain zones or patterns of fracturing, the boundaries of these zones form permeability traps, as in the northern fields of the Tampico region, Mexico, located on a large regional uplift and producing from faulted and fractured Cretaceous limestones. The location pattern of the producing wells and subsurface observations indicate that the oil was concentrated along rather definite zones of faulting and fracturing. Essentially, permeability appears to be confined to these zones and thus limited by the boundaries between fractured and undisturbed limestone. To what extent solution action contributed to the porosity is not known, but classification as a separate type of reservoir is justified because of the distinct relation between productivity and the pattern of fracturing.

Series prepared by Dr. O. Welhelm, Shell Oil Co., Inc. (A. A. P. G. Bulletin Vol. 29, No. 11)

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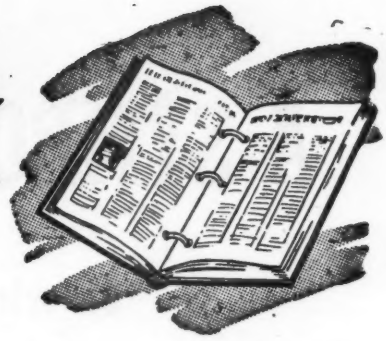
The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL



Alkaline Solutions

AQUEOUS AMMONIA SOLUTIONS

Reference—Manufacturing Chemist's Association of the United States.

Baume for liquids lighter than water = $\frac{140}{\text{Sp. Gr.}} - 130$.

Allowance for temperature—

At 14 to 16 Be. ..... 0.015 to 0.032° between 40 and 100° F.
At 18 to 20 Be. ..... 0.027 to 0.042° between 40 and 100° F.
At 22 to 26 Be. ..... 0.039 to 0.059° between 40 and 90° F.

Be.°	Sp. Gr.	%NH_3	Be.°	Sp. Gr.	%NH_3	Be.°	Sp. Gr.	%NH_3
10.00	1.0000	0.00	15.00	0.9655	8.49	20.25	0.9318	18.24
10.25	0.9982	0.40	15.25	0.9639	8.93	20.50	0.9302	18.72
10.50	0.9964	0.80	15.50	0.9622	9.38	21.00	0.9272	19.68
10.75	0.9947	1.21	15.75	0.9605	9.83	21.25	0.9256	20.16
11.00	0.9929	1.62	16.00	0.9589	10.28	21.50	0.9241	20.64
11.25	0.9912	2.04	16.25	0.9573	10.73	22.00	0.9211	21.60
11.50	0.9894	2.46	16.50	0.9556	11.18	22.25	0.9195	22.08
11.75	0.9876	2.88	16.75	0.9540	11.64	22.50	0.9180	22.56
12.00	0.9859	3.30	17.00	0.9524	12.10	23.00	0.9150	23.52
12.25	0.9842	3.73	17.25	0.9508	12.56	23.25	0.9135	24.01
12.50	0.9825	4.16	17.50	0.9492	13.02	23.50	0.9121	24.50
12.75	0.9807	4.59	17.75	0.9475	13.49	24.00	0.9091	25.48
13.00	0.9790	5.02	18.00	0.9459	13.96	24.25	0.9076	25.97
13.25	0.9773	5.45	18.25	0.9444	14.43	24.50	0.9061	26.46
13.50	0.9756	5.88	18.50	0.9428	14.90	25.00	0.9032	27.44
13.75	0.9793	6.31	18.75	0.9412	15.37	25.25	0.9018	27.93
14.00	0.9722	6.74	19.00	0.9396	15.84	25.50	0.9003	28.42
14.25	0.9705	7.17	19.25	0.9380	16.32	26.00	0.8974	29.40
14.50	0.9689	7.61	19.50	0.9365	16.80	26.25	0.8960	29.89
14.75	0.9672	8.05	20.00	0.9333	17.76	26.50	0.8946	30.38
						26.75	0.8931	30.87
						27.00	0.8917	31.36
						27.25	0.8903	31.85
						27.50	0.8889	32.34
						28.00	0.8861	33.32
						28.50	0.8833	34.30
						29.00	0.8805	35.28

AQUEOUS SODIUM CARBONATE SOLUTIONS

Reference—Data given in International Critical Tables.

Note—Weights are based on anhydrous sodium carbonate. If carbonate with 10 mols of water is used in making solutions, the weights shown in the table should be multiplied by 2.7.

Per cent Na_2CO_3	Specific Gravity, 20°/4°C	Weight of Na_2CO_3 in solution—Gms. per liter	Pounds per U.S. gallon	Pounds per cu. ft.	Baume, degrees	Twaddell, degrees
0.5	1.0043	5.04	0.04208	0.3148	0.6	0.86
1.0	1.0086	10.09	0.08417	0.6297	1.2	1.72
1.5	1.0138	15.23	0.1270	0.9509	1.9	2.76
2.0	1.0190	20.38	0.1701	1.272	2.7	3.80
3.0	1.0294	30.88	0.2576	1.934	4.1	5.88
4.0	1.0398	41.59	0.3471	2.597	5.6	7.96
5.0	1.0502	52.51	0.4381	3.275	7.0	10.04
6.0	1.0606	63.64	0.5311	3.973	8.3	12.12
7.0	1.0711	75.00	0.6256	4.680	9.6	14.22
8.0	1.0816	86.53	0.7221	5.402	10.9	16.32
9.0	1.0922	98.46	0.8202	6.133	12.2	18.44
10.0	1.1029	110.3	0.9204	6.885	13.5	20.58
11.0	1.1136	122.5	1.0222	7.650	14.7	22.72
12.0	1.1244	134.9	1.126	8.424	16.0	24.88
13.0	1.1353	147.6	1.232	9.212	17.2	27.06
14.0	1.1463	160.5	1.339	10.020	18.5	29.26

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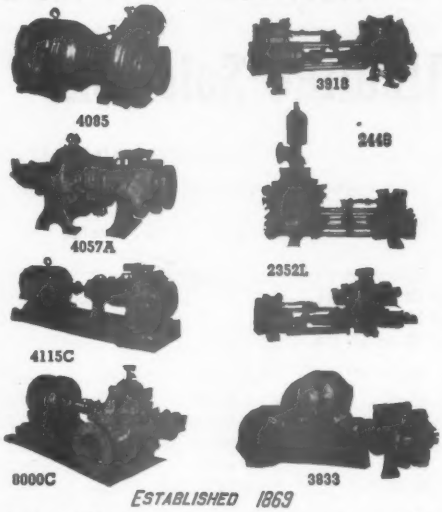

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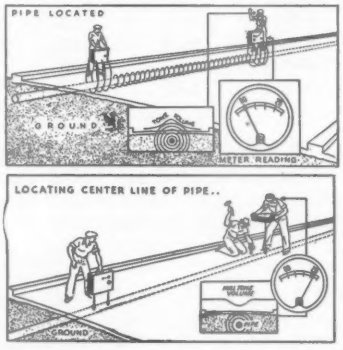

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by Joe Cahill

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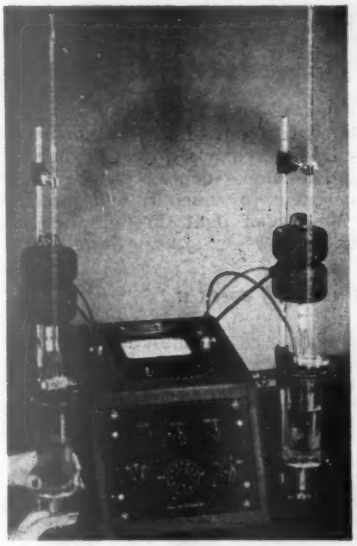

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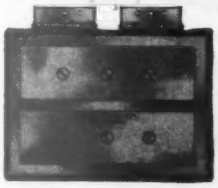

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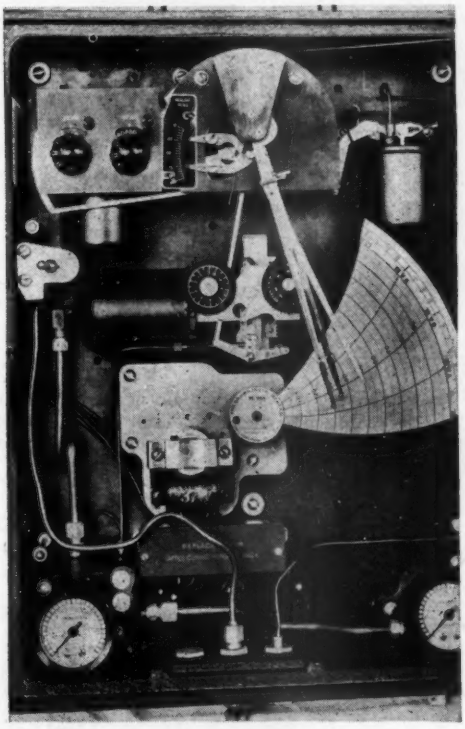

The zero, or linear, adjustment adds or subtracts a constant value. The Indexet was developed to meet a demand for an improved pneumatic type of instrument that will set a control point in which both span and zero shift can be adjusted conveniently without upsetting the control point. *Brown Instrument Co.*

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OIL AND GAS EQUIPMENT Digest — IT'S NEW CHECK IT

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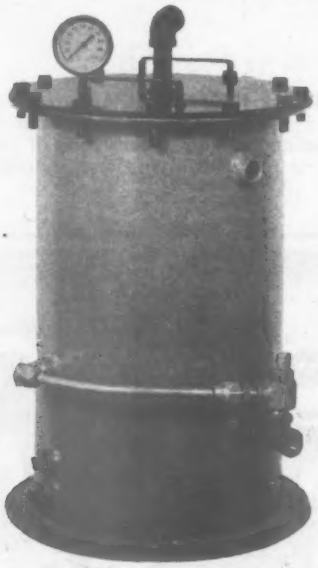

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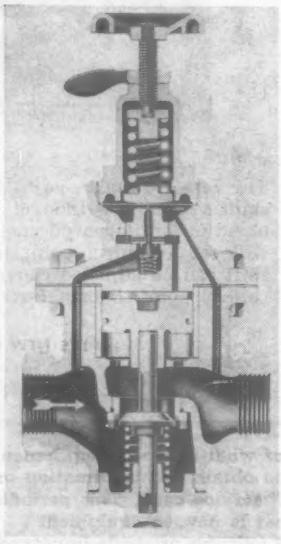

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(6) THE R. S. SMOKE METER, in principle, is a photoelectric soot-density comparator. Based on the fact that a Pyrex glass rod placed across a stream of flue gas containing oil smoke will collect a deposit of soot on the surface which will be a function of the proportion of smoke in the flue gas when exposed under specified conditions, the amount of smoke deposit can be measured in terms of the extent to which it will interfere with the passage of a beam of light through the glass rod onto a photoelectric cell. *The Refinery Supply Co.*

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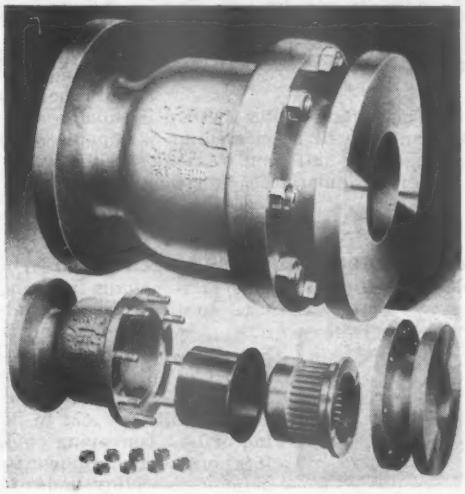


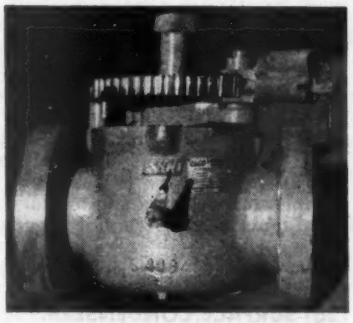
IT'S NEW CHECK IT

(8) A NEW TYPE TRUCK, designed for fast, long-distance hauling, has payload capacity of 20 tons. Easier steering is accomplished through the use of four front wheels in tandem, eliminating the need of power steering. Has three rear axles, including two driving or "live" axles, with a "dead" axle between. Powered by two

standard-make 93 hp. motors mounted in line. Motors can be used together or independently. Standard motors, clutches, transmissions, differentials, axles, wheels, etc., facilitate easy servicing and repair when necessary. *The Eisenhauer Mfg. Co.*

IT'S NEW CHECK IT

(9) DUOSEAL VALVE does not depend upon metal-to-metal contact surfaces for its tightness, but upon a special metallic gasket compound applied under pressure to key points in the valve body and plug. Actually the cylindrical plug fits the body with a fairly generous tolerance and no metal-to-metal seal is obtained. The metallic gasket extruded by pressure through vertical grooves at four points on the plug furnishes the seal in the valve which is capable of holding drop-tight pressures as high as 25,000 psi. Produced in a full range of standard sizes and pressure series. *Electric Steel Foundry.*



IT'S NEW CHECK IT

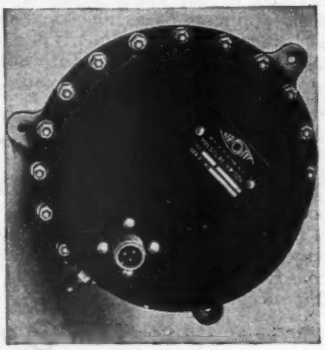
(10) PIPE-LINE STRAINER maintains maximum liquid flow through piping systems while protecting pumps and moving parts of other equipment which might be injured by foreign particles. Total area of the strainer-basket perforations exceeds the area of the opening of the inlet by more than a 1.5 ratio. This greater orifice necessitates less frequent cleaning. Air-pressure relief valve permits escape of air. Also furnished with magnetized strainer basket for intercepting ferrous metal particles too small to be intercepted by the strainer. Strainer basket is removable for cleaning and has a cleanout plug for blow-down cleaning when practical. *J. A. Zurn Mfg. Co.*

IT'S NEW CHECK IT

(11) NEW GAGE-BLOCK UTILITY SET, designed to transfer gage-block accuracy direct to work, consists of three or four holders, trammel points, jaws, scriber, and extension jaws, enabling mechanic to make his own gages more dependably. Simplifies the handling of blocks in well and external measurements. *George Scherr Co.*

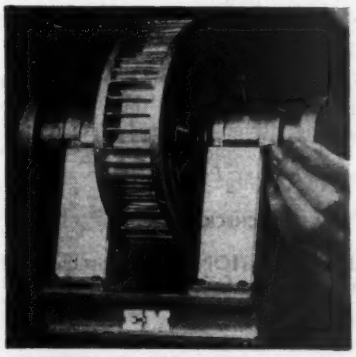
IT'S NEW CHECK IT

(12) ULTRASENSITIVE DIAPHRAGM PRESSURE SWITCH, originally designed to automatically control the intercooler flap on fighter planes, is now available for other applications. Sensitive of 1/100 in. of water on stationary applications, it may be adjusted by means of two knobs to any pressure value desired. For accurately determining these pressures, a draft gage may be connected in parallel with the pressure switch. *Aerotec Co.*



IT'S NEW CHECK IT

(13) NEW MAGNETIC ADJUSTABLE-SPEED DRIVE provides wide-range, quick-response speed control for boiler draft fans, centrifugal pumps, blowers, and compressors. Consisting of two operating parts, a rotating ring and a rotating magnet, the drive is a self-contained, electro magnetic torque transmitter used in combination with a constant speed a.c. motor and an electronic controller to provide split-revolution speed control. Built in ratings approximately 25 hp. and larger at 1,800 to 600 r.p.m. Can be used in combination with synchronous motors to provide power-factor correction. *Electric Machinery Mfg. Co.*



IT'S NEW CHECK IT

TRADE LITERATURE

(14) DRILL-STEM BUSHINGS. Eight-page pamphlet, illustrated with photographs and line drawings, shows specifications and uses of pin-type-drill stem bushings. *Emsco Derrick & Equipment Co.*

IT'S NEW ✓ CHECK IT

(15) STEAM-JET AIR EJECTORS is the subject of a 10-page bulletin which covers this equipment from a semi-technical angle. Charts and cutaway line drawings assist in explaining the technical data presented. Handy reference data, punched for ring binder. *Worthington Pump & Machinery Corp.*

IT'S NEW ✓ CHECK IT

(16) SILVER BRAZING methods and applications are shown in this two-color leaflet. Drawings and pictures show the use of silver-alloy rings in making several different types of joints. *Air Reduction Co.*

IT'S NEW ✓ CHECK IT

(17) SILICONES AS ELECTRICAL INSULATION. Two articles which appeared in a technical magazine are now covered in one reprint. Chemistry of the silicones and their applications as electrical insulating media, as well as test results on various types of motors are covered in this 12-page reprint. A different treatment of these interesting new engineering materials. *Dow Corning Corporation.*

IT'S NEW ✓ CHECK IT

(18) CHEMICALS AND PLASTICS. A 214-page handbook gives definitions, formulas, of all this manufacturer's chemicals. Includes conversion tables, etc. Extremely handy reference book for users and those handling purchases of industrial chemicals and plastics. *Monsanto Chemical Co.*

IT'S NEW ✓ CHECK IT

(19) PICTORIAL PRESENTATION OF MODERN DAY FORGING is found in new 52-page book printed in three colors. The majority of the story is told in pictures with explanatory captions and takes the reader through a modern forging plant, including the chemical and metallurgical laboratory. *Kropp Forge Co.*

IT'S NEW ✓ CHECK IT

(20) "FACTS ABOUT ROTARY PUMPS." New eight-page booklet lists this manufacturer's line of rotary pumps as well as showing design features, diagram of the operating cycle, and new removable liner recently added to these pumps. *Blackmer Pump Co.*

IT'S NEW ✓ CHECK IT

(21) POINTERS ON INSTALLATION and maintenance of hydraulic units and a tear sheet announcing a new hydraulic unit have just been published for the information of all those using this type of equipment. Manual gives suggestions for piping, mounting valves, types of oil, and general maintenance suggestions, as well as performance charts and graphs applicable to the use of seamless tubing in these installations. *John S. Barnes Corp.*

IT'S NEW ✓ CHECK IT

(22) HANDBOOK ON STAINLESS STEEL presents in a handy pocket size 100 pages of information on 26 types of these alloys. Contains a 44-column chart giving analyses, properties, hot working temperatures, and heat treatment and a general discussion of types and properties of stainless. Includes a table of corrosion resistance of 4 leading types to 230 chemicals and common materials. *Allegheny Ludlum Steel Corp.*

IT'S NEW ✓ CHECK IT

(23) FLOW CHART FOR STEAM DRILLING RIG has been issued by manufacturer of steam specialties. Attractively printed in colors, this chart shows the flows of live and exhaust steam, feed water and cooling water from the water storage to the boilers and drilling engines back through the exhaust system. An attractive piece of literature. *Thornhill-Craver Co., Inc.*

IT'S NEW ✓ CHECK IT

(24) WELDING RODS. New 16-page, 2-color booklet describes in detail physical and chemical properties of phosphor bronze electric welding rods. Gives uses and techniques for welding copper, bronze, cast iron, steel, and alloys. *Eccles & Davies Machinery Co., Inc.*

IT'S NEW ✓ CHECK IT

(25) STAINLESS STEEL. A 32-page booklet gives pictorial stories of this manufacturer's products in their transition from war to peacetime uses. Very interesting photographs of naval and military uses, as well as peacetime applications. *Republic Steel Corp.*

IT'S NEW ✓ CHECK IT

(26) SURFACE CONDENSERS. A 54-page manual illustrates manufacturer's complete line as well as giving technical data on applications of surface condensers. Calculating charts, design calculations, and construction details are adequately covered. *Ross Heater & Mfg. Co.*

IT'S NEW ✓ CHECK IT

(27) HYDRAULICS. House organ of hydraulic equipment manufacturer in special issue answers many important questions concerning hydraulic drives and a wide variety of applications. Questions regarding selection of best type of hydraulic drive are answered in a nontechnical article. Construction of both types of hydraulic drives fully and simply discussed. *Twin Disc Clutch Co.*

IT'S NEW ✓ CHECK IT

The Oil and Gas Equipment Digest presents a review of what is new in equipment and trade literature . . . makes it possible for readers to obtain full information on every subject by use of convenient "Check It—Mail It" service card. This periodic feature of The Oil and Gas Journal will include all that is new in equipment . . . at a time when new products are being introduced, and existing products improved.

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Natural Gas

East Ohio 'Show Cause' Order Set for Hearing

WASHINGTON. — East Ohio Gas Co.'s contest against efforts of the Federal Power Commission to bring the company under its jurisdiction will be heard before the commission March 18 in Washington.

A "show cause" order in which the commission directs the company to give reasons why it should not be classified as a natural gas company under the federal natural gas act has been scheduled for a consolidated hearing together with the applications of East Ohio and of Hope Natural Gas Co. for authority to construct nearly $10,000,000 worth of pipe line and auxiliary facilities in West Virginia and Ohio.

The "show cause" order against East Ohio, according to the commission, results from an investigation begun in 1939 into the cost of transportation of natural gas by the company from the Ohio River to Cleveland. The investigation was requested by the city of Cleveland, and similar petitions of the cities of Euclid and Lakewood, Ohio, asking that the company be classified under the act have been filed with the commission.

Newly discovered gas reserves in Wyoming County, West Virginia, will be brought into Hope Natural's system on completion of the proposed additions and improvements. The program will cost an estimated $5,237,500. Included is a 55-mile 12¾-in. pipe line from Wyoming County to the Jackson compressor station in Kanawha County, West Virginia, and loop lines, one of which will connect with East Ohio at the West Virginia-Ohio line.

According to its application, East Ohio proposes to build a 144-mile 18 and 20-in. line from Hope Natural's outlet on the Ohio River to the vicinity of Cleveland to alleviate a serious gas shortage and provide for future increased demands. Estimated cost is $4,620,000.

Consumers in Four States Due Refunds of $2,334,319

WASHINGTON.—New rate schedules filed by Natural Gas Pipeline Co. of America which will provide refund of $2,334,319 to consumers who purchase gas from 11 companies in Illinois, Iowa, Kansas, and Nebraska, have been approved by the Federal Power Commission.

The new schedule also will reduce cost of gas to the 11 companies by $687,955 annually in the future. The refund and reduction result from savings in the cost of gas purchased by Natural Gas Pipeline from Colorado Interstate Gas Co. which was directed to reduce its rates in 1942. The United States Supreme Court upheld the commission in the case last year. Colorado Interstate, meantime, had continued to charge its old rates but had deposited sums to cover refunds if the order was upheld.

New South Texas Gasoline Absorption Plant Opened

HOUSTON. — The new $9,000,000 Glenn H. McCarthy gasoline absorption plant at Winnie, Tex., was formally opened last week at a dedication attended by more than 200 South Texas business, government and agricultural leaders.

Described as "an example of perfect conservation" by E. O. Thompson, Texas Railroad Commission, the plant has a processing capacity of 85,000,000 cu. ft. daily—30,000,000 cu. ft. of casinghead gas and 55,000,000 cu. ft. of high-pressure gas.

Before the McCarthy installation recently went into operation, the 30,000,000 cu. ft. of low-pressure gas was flared. Now the plant takes all gas production from four fields, Winnie, Stowell, Fannett, and Fig Ridge, drawing from 182 wells on 85 leases.

The plant is producing propane, liquefied petroleum products, gasoline, kerosene and diesel fuel. The residue gas is supplied to Jefferson Pipe Line Co. and Beaumont Natural Gas Co., affiliated McCarthy companies; Neches Butane Co. which serves the synthetic rubber plant at Port Neches, Texas Public Service Co., Gulf States Utilities power station, and domestic outlets at Central Gardens in Port Neches and Nederland. Among the future consumers of gas from the plant will be Du Pont plants in Orange County.

Features of the plant include compressor capacity of 10,800 hp., two large stationary boilers, two stills, one for distillation and the other for rich oil, both high and low-pressure absorbers and vents, and towers for extracting isopentane, isobutane, butane, propane, and ethane. J. M. Sappington is superintendent, and Leon Dorsey, process engineer.

Natural Gasoline

Output of Light Products Gains 11 Per Cent in 1945

WASHINGTON.—Total production of natural gasoline and allied products rose by 471,575,000 gal. in 1945 with Texas' plants furnishing more than 60 per cent of the increased output.

Bureau of Mines figures placed the year's total production at 4,673,507,000 gal. against 4,201,932,000 gal. in 1944—an increase of 11 per cent. Texas production rose to 2,159,000,000 gal. from 1,870,419,000 gal. in 1944. Other increases were noted in the Louisiana Gulf area, from 492,659,000 gal. in 1944 to 548,902,000 gal. in 1945, and in California, from 771,280,000 gal. in 1944 to 889,473,000 gal. in 1945.

The year's production included 2,210,438 gal. of natural gasoline, 408,333,000 gal. of condensate, 405,727,000 gal. of normal butane, 280,136,000 gal. of propane, and 299,195,000 gal. of commercial butane-propane mixture.

The year end stock picture showed an increase in plant and terminal inventories with a greater reduction in refinery stocks. The net loss for the year was 5,429,000 gal., resulting from a reduction of 29,568,000 gal. at refineries and a gain of 24,139,000 gal. at plants and terminals.

Daily average production in December was up 1 per cent over November, standing at 13,048,000 gal. compared with 12,928,000 gal. in November and 12,804,000 gal. for the entire year 1945.

Much of the increase in December's production over November came from larger output of liquefied petroleum gases and finished gasoline and naphtha. Natural gasoline itself increased only from 199,081,000 gal. to 200,778,000 gal. during the month.

Demand at plants for light products increased 5 per cent during the month to the highest level since July, 1945, due principally to seasonal gain in liquefied petroleum gases and shipment of natural gasoline to refineries. Shipments to refineries of normal butane and iso-pentane have dropped sharply since the summer of 1945.

New Plant Near Completion

LOS ANGELES.—General Petroleum Corp. is completing a new natural-gasoline plant in the Burrel area of Fresno County, California, to handle approximately 25,000,000 cu. ft. of wet gas daily. The company has laid about 30 miles of lateral and feeder lines to facilitate movement of wet gas to the plant and for delivery of dry gas to Southern Counties Gas Co. and Pacific Gas & Electric Co.

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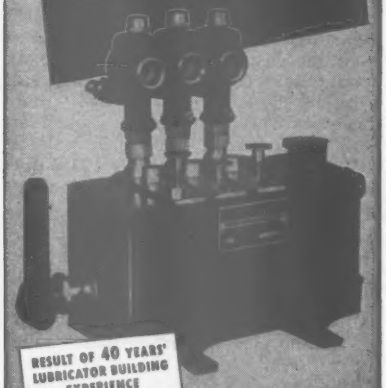
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REFINING

Refiners Wait Answer To Sulfur Content Protest

The Western Petroleum Refiners Association is awaiting a reply to its protest to government authorities against a new government gasoline specification requiring 0.1 sulfur content.

John C. Day, association secretary, emphasized that the requirement is not a federal specification and that it affects only gasoline purchased by the Treasury Department. Association officials, however, fear similar action by some states which base their specifications on federal requirements.

All government gasoline before the war limited sulfur content to a maximum of 0.1 per cent. During the war, riders to specifications allowed a sulfur content as high as 0.25 per cent.

The Army and Navy are reported to have given assurances they will continue the higher sulfur-content specification for gasoline which they purchase. The Treasury Department requirement, Day said, was issued without advance notice to the American Society for Testing Materials Committee which had conferred with the Federal Specifications Board.

One criticism of the Treasury Department requirement was that there is no reason why agencies for which the department purchases should not accept the higher sulfur content if the Army and Navy are willing to do so. Day said many refiners lack equipment to meet the lower sulfur requirement and that there is no positive data to show a harmful effect of higher sulfur in gasoline.

Sunray Buys Refinery, Leases in California

A 7,000-bbl. daily capacity refinery located near Santa Maria, Calif., has been bought by Sunray Oil Corp. from Bell Oil & Refining Co. of California.

Announced at the same time was Sunray's purchase of producing properties of Bel-Air Oil Co. of California, also located in the Santa Maria area of Santa Barbara County. Sunray has an interest in 67 wells in the Wilmington basin of Los Angeles County.

The properties consist of 1,280 acres of leases on which 25 wells are producing approximately 4,500 bbl. daily asphalt base oil from about 5,000 ft., the refinery and associated equipment specializing in the manufacture of asphalt, road and fuel oils, together with the gathering system connecting the wells to the refinery. Other well locations remain to be drilled. Consideration was reported in excess of $2,000,000 in cash and oil.

McClanahan Oil, Mid-West Refineries Merger Seen

GRAND RAPIDS, Mich.—A consolidation of Mid-West Refineries, Inc., Grand Rapids, with McClanahan Oil Co., Mt. Pleasant, Mich., has been indicated in view of reports that New York interests have acquired control of the McClanahan company.

Reports are that a new board of directors of McClanahan consists of Fred S. Hirch and Charles S. Hale, both of New York; Thorne Horsfield, Cleveland; C. A. Van Deusen, San Diego, and Siegel W. Judd, Mid-West president. The McClanahan company was organized in 1913 by Walter L. McClanahan, Grayling. In 1940 he was succeeded as president by John Brunn, Grayling.

Acid Plant to Be Sold

WASHINGTON. — A sulfuric acid plant at Beaumont built at a cost of $753,000 for operation by South Acid & Sulfuric Acid Co. during the war, is offered for sale as surplus property by War Assets Corp.

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Refiners Meeting to Hear Papers on New Processes

FORT WORTH. — Catalytic cracking processes, desalting methods, and the use of stainless steel will be discussed before members of the Western Petroleum Refiners Association during technical sessions at their thirty-fourth annual meeting here March 25-27.

Papers scheduled for the technical session March 26 will be given by F. Duane Fuqua, Ben Franklin Refining Co., Ardmore, Okla., on "Crude Oil Desalting," and by Davis Read, Universal Oil Products Co., Chicago, on "The New U.O.P. M.S. Fluid Type Catalytic Cracking Unit."

Wednesday the refiners will hear papers by John S. Ewing, Carnegie-Illinois Steel Co., Pittsburgh, on "Stainless Steel and Its Application to the Refining Industry," and by H. D. Noll and K. G. Holdom, Houdry Process Corp., and Eric Bergstrom, Socony-Vacuum Oil Co., Inc., on "Simplicity and Flexibility of Thermofor Catalytic Cracking."

Technical sessions will be held in the mornings of the two days, with general sessions following in the afternoons. The annual dinner dance of the association will be held March 27. The Blackstone Hotel is headquarters for the meeting.

Senate Bill Favors Small Refineries for U. S. Oil

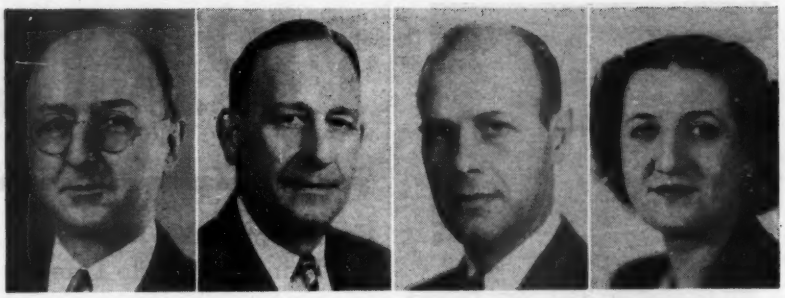
WASHINGTON. — The Senate has passed and sent to the House a bill (S. 680) to give small refineries preference in the purchase of government royalty oil.

The bill provides that the Secretary of the Interior may give prefence to refineries which do not have their own source of crude to permit them to purchase government royalty oil for use or processing and not for resale as such. Purchases would be made by private sale at not less than the market price.

Navy Extends Contracts With Wyoming Company

CODY, Wyo.—The Navy's fuel oil shortage on the West Coast has resulted in another 3-months' extension of contracts between the Navy and Husky Refining Co. for the output of the company's refineries at Riverton and Cody.

The Riverton plant was enlarged from 5,000 bbl. to 7,000 bbl. daily capacity last year at the Navy's request. It closed down when hostilities ceased but reopened early this year in view of the oil shortage. Production at the Cody refinery was stepped up in January to help meet the Navy's needs.



This group has been instrumental in planning the program and arrangements for the first postwar meeting of the Western Petroleum Refiners Association to be held March 25-27 in Fort Worth. They are C. L. Henderson, Vickers Petroleum Co., Wichita; and John C. Day, secretary-manager; Paul D. Williams, technologist; and Miss Lucille Dennis, assistant treasurer, of the Tulsa office

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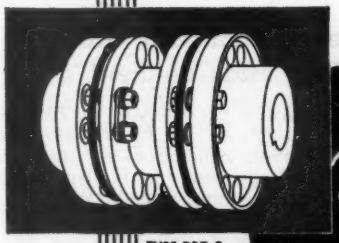

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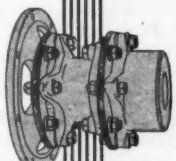

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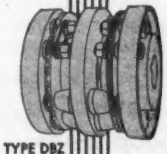

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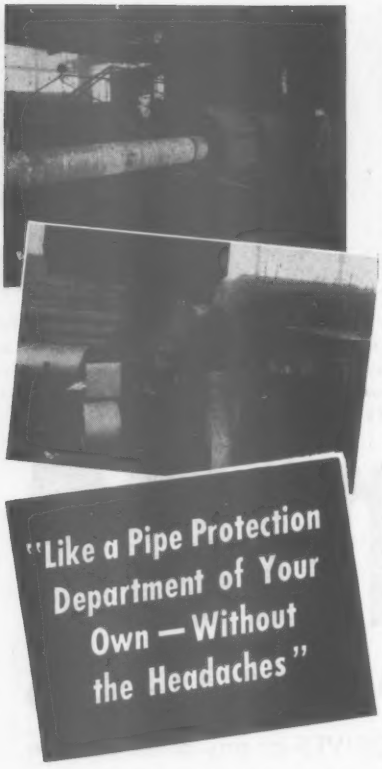

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PIPE LINES

Four Companies Negotiate For Montreal Crude Line

MONTREAL, Que. — A group of four major Canadian oil companies, all with refineries in Montreal, are negotiating for the purchase of the 236-mile Portland-Montreal pipe line.

Constructed in 1942 as a result of the intensive submarine campaign, the line has transported more than 50,000,000 bbl. of crude to Montreal. It is owned by Portland Pipe Line Co., a subsidiary of Standard Oil Co. of New Jersey.

Frederick C. Schultz, president of the pipe-line company, in disclosing negotiations for several months with the Imperial Oil, Ltd., British-American Oil Co., Ltd., McColl-Frontenac Oil Co., Ltd., and Shell Oil Co. of Canada, Ltd., stated that the change of ownership "would better guarantee continued full operations as the four companies each have refineries in Montreal and are receiving crude-oil deliveries from our line."

Jersey Standard Group Visits Mid-Continent

A group of officials of Standard Oil Co. (N. J.) and its affiliates early this week concluded an inspection tour of operations in Louisiana, Mississippi, Arkansas, and Oklahoma.

In the group were B. B. Howard, New Jersey Standard director; W. R. Finney, pipe line adviser of the New Jersey company and a director of Interstate Oil Pipe Line Co.; John W. Brice, assistant to the New Jersey company coordinator of production, a director of Interstate, and formerly executive vice president of Carter Oil Co.; and Charles L. Lockett, also of the production coordinator's office, all of New York. They were accompanied by L. F. Kahle, Interstate president. O. C. Schorp, Carter president, joined the group in Shreveport and accompanied them to Tulsa.

Phillips Petroleum Co. Plans New Loop Lines

BARTLESVILLE.—Work is due to begin about April 15 on construction of about 75 miles of 12-in. gasoline loops for Phillips Petroleum Co. between Borger, Tex., and Wichita, Kan.

Vaughn & Taylor Construction Co., Wichita Falls, Tex., contractor for the new project, has just completed about 55 miles of lines for Phillips Petroleum in the Fullerton field and for Huber Gas Corp. at Borger.

Four Terminals Planned on Humble's New Gasoline Line

HOUSTON.—Humble Oil & Refining Co.'s gasoline distribution system will be given four additional and improved outlets when the company's new Houston-North Texas gasoline pipe line becomes a reality.

The project is due to be completed in late summer or early autumn. It consists of a 265-mile, 8-in. line leading from the Baytown refinery to a point on the Dallas-Fort Worth north highway.

In addition to a terminal at the north end of the line, three other terminals will provide distribution and storage outlets at Little York, north of Houston, at Hearne and at Waco. Construction supervision and operation of the line will be by Humble Pipe Line Co., while the com-

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pany's sales department will be in charge of terminals and distribution facilities.

All-welded construction is planned. Pipe will be double coated with enamel covered with a special wrap followed by a second coat of enamel and a final heavy felt wrap. Electric pumping stations will be built at the Baytown refinery and at Hearne.

Conrad Field Line Completed

CALGARY. — A pipe line linking the Mid-Continent-East Crest tank farm with the gathering system of Standard Oil Co. of California in the Conrad field, southern Alberta, has been completed by Mid-Continent Gas & Oil Co. of Calgary. The line will facilitate steady production of 130 bbl. daily from two wells in the field.

FPC Hearing Scheduled on Kentucky Natural Projects

WASHINGTON. — Applications of Kentucky Natural Gas Corp. to enlarge its system by two new pipe line construction projects were to be heard early this week by the Federal Power Commission in Washington.

The projects consist of 18 miles of 10¾-in. transmission line from near Russellville, Ky., to the vicinity of Mitchellville, Tenn., to provide a new interconnection with the Tennessee Gas & Transmission Co. system, and about 30 miles of 6-in. line from a point on the Panhandle Eastern Pipe Line Co. line to a connection with Indiana Gas & Water Co., Inc., near Martinsville, Ind. Estimated cost of the facilities is $458,840.

New Gulf Refining Loop Lines Now in Operation

MIDLAND, Tex.—Gulf Refining Co. now has outlets for 115,000 bbl. daily of West Texas crude, since its 450 miles of new loop lines between the Keystone field in Winkler County and Port Arthur have been placed in operation.

The new facilities were built at a cost of about $8,000,000. The lines, now moving sweet crude from the Permian Basin, include 303 miles of 10-in., 44 miles of 12-in., and 63 miles of 8-in.

New Stanolind Line Opened in Wyoming

CASPER, Wyo.—A total of 7,500 bbl. of crude daily, two-thirds of which comes from Steamboat Butte, is now flowing through Stanolind Pipe Line Co.'s new line in Freemont County, Wyoming.

The 8-in. line extends 69 miles from Pilot Butte to Lysite where it connects with the Elk Basin-Casper line. An additional 22 miles of 6-in. line was finished last month.

New Line Near Completion

MIDLAND, Tex. — Completion is due soon for a new 6-mile line in West Texas by which Texas-New Mexico Pipe Line Co. will move crude from east central Crane County to its Crane station. The line will take sweet crude from the thus far single producer in the "Block 31" Crane County field. From the company's Crane station, the oil will be moved to tide water terminals in batches.

BUCKEYE MAINLINERS
for faster digging of trenches for crude lines. Digs trench 24" to 39" wide — up to 8½' deep.

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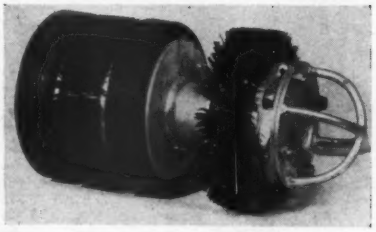
WRITE FOR LATEST INFORMATION
Jet-Rotation Pigs CLEAN PIPELINES BETTER



Type RC Pipe Line Pig
- A proven scraper tool
- With Jet-Rotation feature*
- Revolves as it cleans
- Distributes wear of wire brushes and rubber cups

For crude oil, products, natural gas and water lines. Sizes 6-inch to 16-inch. Other types in sizes 2-inch to 26-inch.

*Patent pending.

THE PIG WITH THE POKE CLEANS PIPE LINES
T. D. WILLIAMSON, Inc.
TULSA, OKLAHOMA

STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED MARCH 9, 1946

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1946				
	Comp.	Oil	Gas	Dry	Footage	1946	1945	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	34	17	0	*17	56,900	290	258	0	0	0	0	0	0	0	0	0	0
Pennsylvania	76	37	5	†34	126,212	806	614	0	0	0	0	0	0	0	0	0	0
West Virginia	13	0	13	0	32,756	118	108	0	0	0	0	0	0	0	0	0	0
Ohio	29	8	6	15	79,174	197	134	0	0	0	2	2	1	0	5	8	14
Indiana	4	3	0	1	8,503	55	36	0	0	0	0	0	0	0	0	6	6
Kentucky	5	1	2	2	12,382	79	74	0	0	0	1	1	1	0	0	10	11
Illinois	35	24	0	11	84,892	353	324	0	0	0	4	4	7	0	0	62	69
Michigan	12	5	0	7	31,792	124	135	0	0	0	2	2	3	0	0	39	42
Kansas	32	18	6	8	105,904	380	276	0	0	0	2	2	4	0	1	45	50
Neb., Mo., Iowa	0	0	0	0	0	4	10	0	0	0	0	0	0	0	0	2	2
Oklahoma	43	22	4	‡17	135,607	452	454	1	0	0	7	8	14	0	7	61	82
Texas	112	60	7	45	492,679	1,409	1,312	2	0	0	24	26	24	1	5	207	237
North Central	41	19	0	22	116,089	480	380	1	0	0	12	13	6	0	0	72	80
West	20	12	0	8	108,643	301	341	0	0	0	6	6	7	0	0	36	43
Panhandle	3	0	0	3	8,902	72	105	0	0	0	0	0	0	0	0	2	2
Eastern	12	7	3	2	68,044	130	57	0	0	0	1	1	1	0	1	23	25
Gulf Coast	24	16	3	5	148,686	331	304	1	0	0	2	3	5	0	2	47	54
Southwest	12	6	1	5	42,315	95	125	0	0	0	3	3	3	1	2	27	33
Louisiana	35	14	9	12	255,041	240	167	0	0	1	6	7	13	1	1	26	41
Northern	18	6	8	4	97,108	119	53	0	0	0	2	2	2	0	0	15	17
Southern	17	8	1	8	157,933	121	114	0	0	1	4	5	11	1	1	11	24
Arkansas	3	2	0	1	14,654	34	26	0	0	0	0	0	2	0	0	5	7
Mississippi	5	4	0	1	36,441	43	62	0	0	0	0	0	1	0	0	10	11
Southeastern States	3	0	0	3	10,444	11	4	0	0	0	3	3	0	0	0	10	10
Montana	7	5	0	2	18,564	48	57	2	0	0	0	2	2	0	0	2	4
Wyoming	7	2	1	4	26,970	38	41	1	0	0	4	5	4	0	2	16	22
Colorado	3	3	0	0	19,572	19	7	1	0	0	0	1	1	0	0	3	4
New Mexico	5	3	1	1	22,034	74	96	0	0	0	1	1	1	0	0	7	8
California	34	28	0	6	135,424	333	439	0	0	0	4	4	3	0	2	37	42
Utah	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	1	2
Total United States	497	256	54	187	1,705,945	5,109	4,634	7	0	1	60	68	82	2	23	557	664
Total previous week	467	278	45	144	1,642,422	4,612	4,200	14	0	1	33	48	75	2	22	497	596
Total March 10, 1945	435	218	56	161	1,652,471	4,634	3,511	11	2	3	58	74	118	3	28	630	779

Service wells included: *17, †33, ‡1.

MARKET QUOTATIONS

(Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gal. as of last Monday.)

REFINERY GASOLINE

Octane (A.S.T.M.)	78-80†	73-75
Mid-Continent*	5.625-6.00	5.00-5.25
Texas Gulf Coast	6.375	5.375-5.75
New York Area		7.425-7.90
California		6.00-6.875

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	26-70	18-55
Oklahoma (Group 3)	2.750	3.300
N. Texas (f.o.b. plant)	2.250	2.700
N. Louisiana (f.o.b. plant)	2.625	3.150
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana, avg. grav.	1.20
Illinois Basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.08

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.	Oklahoma, Kansas	Gulf Coast Texas	West Tex.*
18-18.9	$0.80			
19-19.9	.84		$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9		1.07	1.30	.94
32-32.9		1.09	1.32	.96
33-33.9		1.11	1.34	.98
34-34.9		1.13	1.36	1.00
35-35.9		1.15	1.38	1.02
36-36.9		1.17	1.40	1.04
37-37.9		1.19	1.42	1.06
38-38.9		1.21	1.44	1.08
39-39.9		1.23	1.46	1.10
40 and above		1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended March 2, 1946

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks—Gasoline	Stocks—Distillate	Stocks—Residual
East Coast	756	23,160	7,107	6,366
Appalachian	165	4,053	507	611
Ill., Ind., Ky.	762	23,611	3,142	3,071
Okla., Kan., Mo.	369	10,020	1,307	1,009
Inland Texas	196	3,168	279	537
Tex. Gulf Cst.	1,191	15,732	4,512	3,771
La. Gulf Cst.	338	4,549	1,136	1,254
N. La., Ark.	59	1,906	558	206
Rocky Mtn.	111	2,359	391	614
California	832	15,904	6,209	20,846
Total 3- 2-46	4,779	104,462	25,148	38,285
Total 2-23-46	4,595	104,709	25,898	39,290
Total 3- 3-45	4,775	97,810	27,103	45,002

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended:	Bbl. of crude*
March 2, 1946	229,430,000
February 23, 1946	226,699,000
March 3, 1945	218,675,000

*Excludes unrefinable Calif. stocks.

TRENDS

DAILY AVERAGE PRODUCTION FOR WEEK

	Mar. 9 crude oil	Bureau of Mines March demand	Mar. 2 crude oil
Alabama	1,000	500	1,050
Arkansas	77,350	76,000	77,000
California	835,750	838,000	847,650
Colorado	22,990	23,000	21,830
Eastern	66,750	61,200	61,300
Florida	100	100	100
Illinois	207,500	198,000	214,500
Indiana	18,700	13,000	18,250
Kansas	244,650	252,000	257,050
Kentucky	30,550	29,000	30,200
Louisiana	375,700	372,000	371,650
North Louisiana	82,350	.....	82,800
South Louisiana	293,350	.....	288,850
Michigan	45,100	46,000	42,800
Mississippi	55,300	52,000	55,150
Montana	21,670	20,400	21,690
Nebraska	850	800	850
New Mexico	95,150	98,000	98,450
Oklahoma	381,550	366,000	389,450
Texas	1,817,450	1,910,000	2,109,250
East Texas	317,400	.....	321,000
East Central Texas	127,500	.....	146,200
North Central Texas	146,050	.....	157,600
Texas Panhandle	81,000	.....	81,000
West Texas	436,500	.....	503,300
Southwest Texas	290,200	.....	356,150
Texas Gulf Coast	418,800	.....	544,000
Wyoming	91,200	94,000	91,250
Total United States	4,389,310	4,450,000	4,709,470
Change from prev. wk., down	320,160		
Total production Jan. 1-Mar. 9			322,137,760 bbl.
Same period last year			322,207,700 bbl.

CRUDE-OIL STOCKS 229,430,000 bbl. as of Mar. 2—up 2,731,000 bbl. One year ago 218,675,000 bbl.

GASOLINE STOCKS 104,462,000 bbl. as of Mar. 2—down 247,000 bbl. One year ago 97,810,000 bbl.

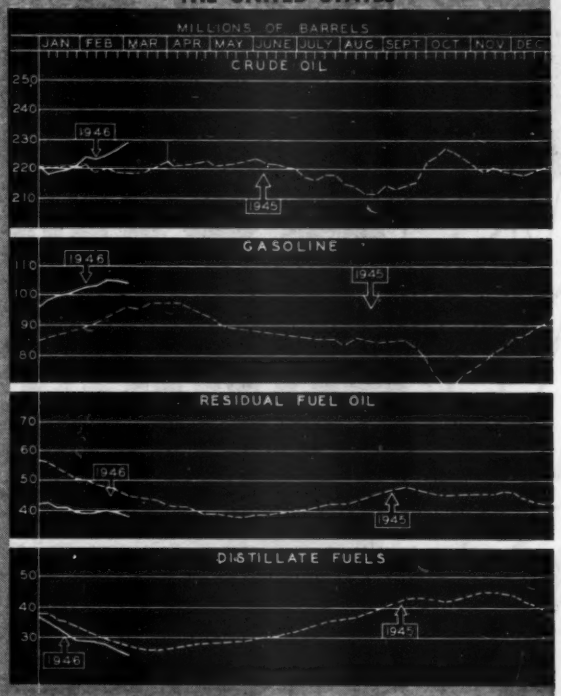
RESIDUAL FUEL-OIL STOCKS 38,285,000 bbl. as of Mar. 2—down 1,005,000 bbl. One year ago 45,002,000 bbl.

GAS OIL AND DISTILLATE STOCKS 25,148,000 bbl. as of Mar. 2—down 750,000 bbl. One year ago 27,103,000 bbl.

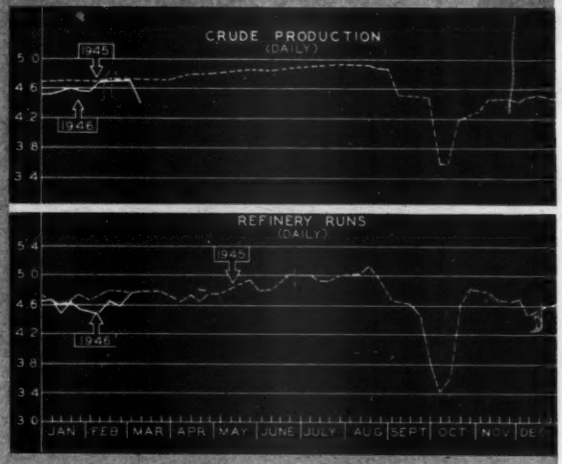
CRUDE-OIL PRODUCTION 4,389,310 bbl. as of Mar. 9—down 320,160 bbl. One year ago 4,770,750 bbl.

REFINERY RUNS 4,779,000 bbl. daily week ended Mar. 2—up 184,000 bbl. One year ago 4,775,000 bbl.

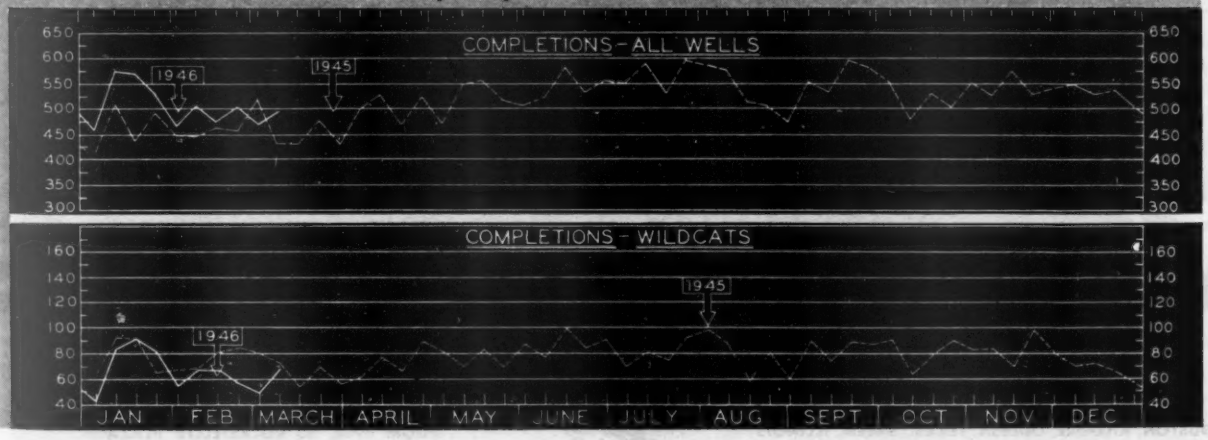
OIL STOCKS IN THE UNITED STATES



DAILY OPERATIONS



Solid line charts weekly completions, service wells in Eastern area included



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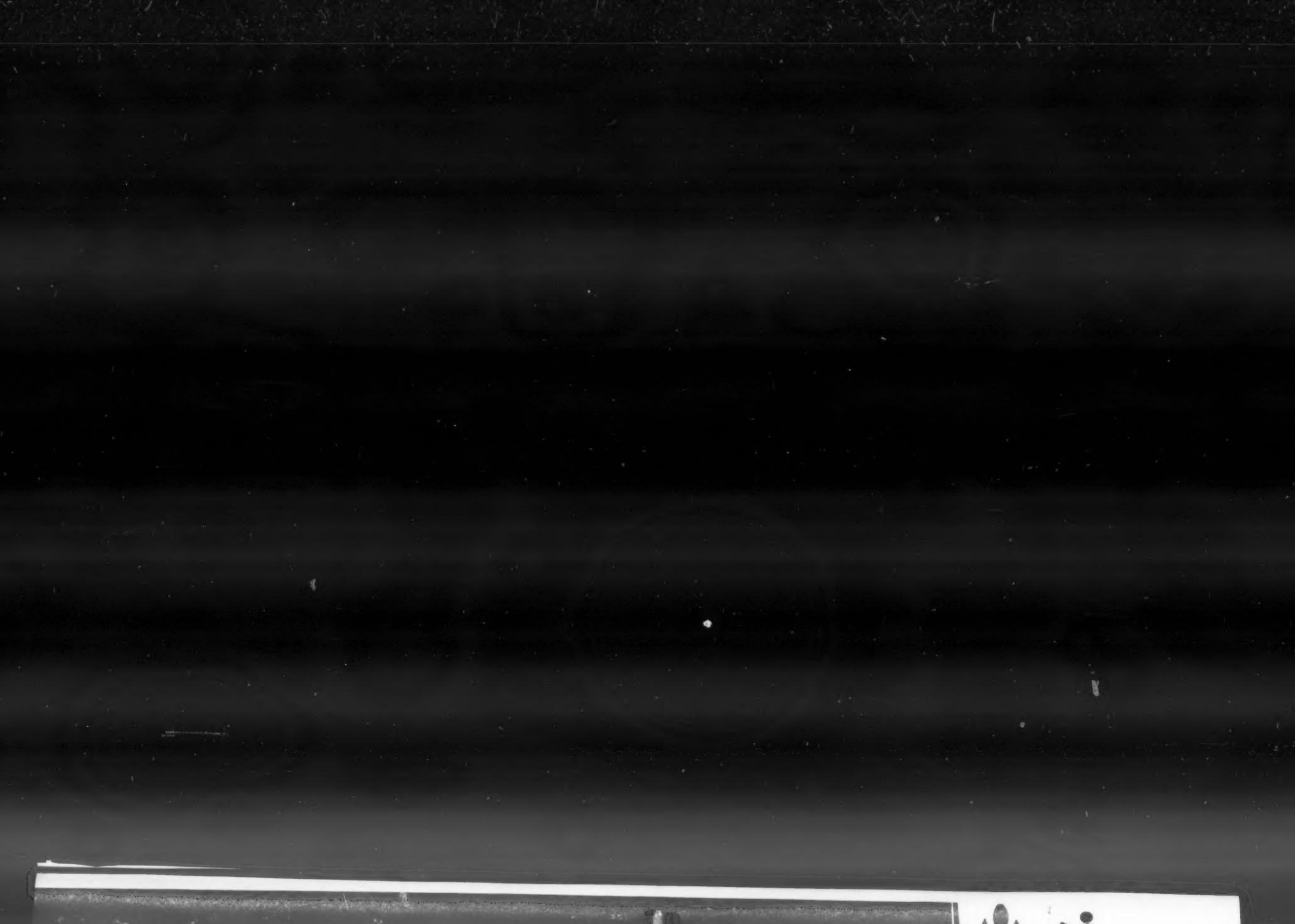


Exploration and Drilling

Solving West Texas Problems

WHEN the dominant exploration tool fails to work satisfactorily in an area known to be one of the most promising in the country for finding new reserves, a solution has to be found. That is the problem that is being solved in West Texas, where the reflection seismograph technique was found unsuitable over a large portion of the Edwards Plateau.

The most promising solution appears to be a return to the old refraction seismograph principles and development of modifications in the old techniques of that method to give reasonably satisfactory answers. Several seismograph operators began trying this a few years ago, and more or less independently, have developed what is usually known as the refraction correlation technique.

At best, refraction shooting has a greatly reduced accuracy compared to reflection shooting, and will not permit evaluation of small anomalies. However, new techniques permit securing data of value in checking large-sized anomalies.

The present methods used in West Texas are believed to permit reasonably accurate detection of anomalies of 50 ft. of closure in the Permian, and of approximately 100 ft. closure in the pre-Permian. Since pre-Permian structures in this area are comparable to Rocky Mountain geology as regards the order of magnitude of structural relief, this degree of accuracy in detection seems sufficient.

Improvement in refraction shooting techniques has been rather rapid, after the usual slow start that always accompanies a new development. It is rather difficult to evaluate the latest improvements, because of the time lag between shooting and wildcat testing. Many geologists in West Texas believe that when the seismograph results indicate a pre-Permian structure, there is one present somewhere, but not always exactly where geophysical interpretation places it. This belief may, or may not, be due to results from the earlier stages of the new technique.

Another interesting speculation arises out of this return to an older basic principle, once thought outmoded, to solve new problems. There is at least a faint flicker of interest among a few engineers about cable-tool drilling. If some engineering theories should prove true, there are possibilities of revolutionizing the speed of deep cable-tool drilling, stepping up hole-making time by a factor of two to possibly six or eight times; with efficiency increasing with depth.

The cost of rotary drilling in hard formations rises rapidly with depth, because of time consumed in round trips to change bits. Therefore, theoretically, if the cable-tool drillers could overcome certain basic difficulties, they might stage a comeback on deep drilling. However there would be other problems involved, particularly the number of strings of casing required to maintain walls of the hole.

SOUTH LOUISIANA

Dual Completion Made by Pan American Production

NEW ORLEANS.—Dual completion in new sand at Port Barre field, St. Landry Parish, has been made by Pan American Production Co. at 16 H. L. Garland, 4-6s-5e. Drilled to 10,375 ft., before any tests were made, the 7-in. pipe was set to 9,129 ft. to protect the sands while drilling down. Pipe was perforated with 124 shots from 8,982-98 ft. with 48 shots from 9,004-10 ft. and with 64 shots from 9,040-48 ft. for a gage of 500 bbl. of 35°-gravity oil daily through a ¼-in. choke and 575,000 cu. ft. of gas daily through a ½-in. choke. Tubing pressure is 2,350 lb. and casing pressure 2,600 lb.

Slight shows of oil have been encountered in Sugarfield Oil Co., Inc. 1 Jones Estate, wildcat test in East Baton Rouge Parish, 44-6s-1e. Reports are that the well cut a 375-ft. fault, and had some slight shows of oil from 6,890-6,918 ft., 6,946-81 ft., and 6,350-70 ft. An electrical log was run to 7,754 ft. and sidewall samples taken of the shows.

Egan field in Acadia Parish was extended to the southwest by Irwin and Hudson et al 2-B Houssiere-Latreille, NE 30-9s-2w. Drilled to a depth of 10,121 ft., with 5½-in. production casing on bottom, this well flowed 240 bbl. of 37°-gravity pipe-line oil daily through a 9/64-in. choke with 1,500 lb. flowing pressure on the tubing, and a gas-oil ratio of 750 to 1. Production is through 72 perforations from 10,086-098 ft.

Humble Oil & Refining Co. 2 Mayo Romero, second test in the New Iberia field of Iberia Parish, 49-12s-7e, is swabbing in through 36 perforations at 9,660-65 ft. This well was drilled to a total depth of 9,844 ft., and the 7-in. casing set at 9,735 ft.

Sixteen new locations were reported, 3 being wildcats, 1 each in Jefferson Davis, Terrebonne, and Vermilion parishes. Of the 17 completions 1 was a new gas sand in Belle Island field in St. Mary Parish, and 4 dry holes, 1 each in Cameron, Iberville, St. Mary, and Vermilion parishes.

SOUTH LOUISIANA SUCCESSFUL WILDCAT

St. Mary Parish: New gas sand Belle Island—The Texas Co. 4 State-340-Atchafalaya Bay, in the bay, Twp. 18s-10e, TD 10,653 ft., top sand 9,790 ft., perforations 9,790-9,806 ft., PT 2,000,000 cu. ft. gas daily through 10/64-in. choke, tubing pressure 3,525 lb., shut-in tubing pressure 3,600 lb., dry gas, no water.

SOUTH LOUISIANA WILDCAT FAILURES

Cameron Parish: Superior Oil Co. 1-E Miami Corp., in Little Chenier area, 9-14s-5w, dry, TD 10,100 ft.

Iberville Parish—Humble 1 Baist Cooperage Lbr. Co., Inc., in Bayou Sorrell area, 92-10s-13e, dry, TD 10,960 ft.

St. Mary Parish—Texas Co. 8 State-Cote Blanche Island lease 340, in Cote Blanche Island area, 11-15s-7e, dry, TD 6,239 ft.

Vermilion Parish—Humble 1 A. J. Marceaux, Kaplan area, 29-12s-2e, dry, TD 12,177 ft.

EASTERN TEXAS

Lone Star Well Becomes Opelika's First Oiler

DALLAS.—Lone Star Producing Co. 1 Bukalew, A. Anglin Survey, is reported to be making a nice oil well in the Opelika gas field of Henderson County. The well is on the northwest edge of the big gas field and is the first oil production. Casing was perforated in the Rodessa pay zone from 8,830-50 ft.

Barnsdall Oil Co. 1 Pickering, R. E. Sevey Survey, 3 miles southwest of the Eylaub pool of Bowie County, flowed gas and distillate into pits and was cleaning itself, making gas, distillate, and some wash water. It is estimated to be making 2,000,000 cu. ft. of gas daily. Production is through perforations from 7,030-94 ft. in the Smackover.

Delta Drilling Co. 1 White, Stark Survey, wildcat 5 miles northeast of Quitman in Wood County, ran electrical survey, and the operator plans to abandon at 5,491 ft. Magnolia Petroleum Co. 1 Orr, Fowler Survey, wildcat 3 miles southwest of Avinger in northwestern Marion County, was drilling below 10,222 ft. in shale and sandy lime in the Cotton Valley topped at 9,110 ft. Elevation is 439 ft. Humble Oil & Refining Co. 1 Freeman, Little Survey, Travis Peak wildcat in the Brushy Creek area of northeastern Anderson County, was drilling below 11,283 ft. in lime and shale.

Hawkins field, Wood County, had four completions this week, Carthage field, Panola County, had three, and Sand Flat field, Smith County, two. Carthage field had four locations, and Hawkins field three. Hawkins field has 27 drilling wells; Carthage field 26; New Hope, Franklin County, 6, and Waskom field, Harrison County, Pick-

ton field, Hopkins County, and Sand Flat field each have 3.

EASTERN TEXAS WILDCAT FAILURE

Hill County: Thomas & Ellis 1 E. M. Hawkins, Thomas Cook Sur., 1 mi. NW Hubbard, Woodbine 1,172 ft., dry at 1,248 ft.

TEXAS GULF COAST

San Jacinto County Test Shows Gas-Condensate

HOUSTON.—A new gas-condensate pool for San Jacinto County, 15 miles southwest of the townsite of Sheppard, and 2½ miles southwest of the Mercy field, is indicated at Fred M. Manning, Inc. 1 Central Coke & Coal Co., J. Ferguson Survey, which was reported flowing through an 11/64-in. choke with 650 lb. pressure on the tubing and 350 lb. pressure on the casing. Gravity of the condensate was 51°. Total depth is 11,001 ft. and test is producing through drill pipe cemented at 10,700 ft.

Magnolia Petroleum Co. 2 Bolton, wildcat test and new field opener 3 miles west of Glendale in Trinity County, Henry Bond League, gaged 66 bbl. of 51°-gravity condensate with 2,295,000 cu. ft. of gas daily through a ¼-in. choke with approximately 2,200 lb. flowing pressure on the tubing. Flow is from the Edwards lime through 240 perforations from 10,500-540 ft. Operators are reported to be acidizing through perforations in an attempt to increase the fluid flow. Total depth is 12,505 ft., and 7-in. casing is cemented at 10,642 ft. and 5-in. liner set from there to the bottom. On a test in the Rodessa through 48 perforations from 11,712-720 ft., using ¼-in. chokes top and bottom, tool open 13 hours, the well would not flow, recording no pressure, and when tool was pulled it showed a recovery of 3,800 ft. of salt water.

A gage has been reported on Ohio Oil Co.'s discovery well, 1 Kirby Lumber Corp. in the James McCoy League, Liberty County, in East Cleveland area. The well gaged 51 bbl. of 54°-gravity condensate and 11 bbl. of salt water in 24 hours through the regulator using a ⅜-in. choke on the vent line. Tubing pressure is 3,210 lb., and casing pressure is 2,910 lb. Total depth is 10,285 ft., plugged-back depth 9,173 ft., with 7-in. casing cemented at 9,205 ft. and perforated with 63 shots from 9,106-27 ft.

A new sand for Needville field in Fort Bend County has been opened by W. L. Goldston 5 E. C. Farmer, in Robert Hodge Survey, Abstract 33, total depth 6,700 ft., with perforations from 6,675-78 ft. Sand thickness reported from 6,660-5,590 ft. flowed 146 bbl. of 28°-gravity oil daily through a ⅛-in. choke, no water, gas-oil ratio 560 to 1, and tubing pressure 1,160 lb.

On the west side of Arnim field in Fayette County, K. D. Owen and D. C. Bintliff 1 E. A. Arnim Estate, pumped 74 bbl. of oil daily through 36 holes from 2,049-61 ft. Total depth is 2,065 ft., with 5¼-in. casing cemented on the bottom.

Humble Oil & Refining Co. 10 Edward F. Milo et al, C. N. Pillot Survey in the Tomball pool of Harris County, was carried to 15,452 ft., deepest test drilled in Harris County, flowed muddy water and gas and then died on latest test made through perforations, 120 shots, from 8,820-8,840 ft. A number of tests made at deeper levels showed gas and salt water.

A. H. & C. L. Rowan have made location for a 10,500-ft. wildcat test 3 miles west of Beaumont in Jefferson County. It will be their 1 Beaumont Building & Loan Co. in the C. Williams Survey, Abstract 59, located 4,150 ft. from west line and 1,890 ft. from south line of the survey.

Also in Jefferson County, Sun Oil Co. 2 Gilbert Estate, 8,370 ft. south and slightly east of the 1 Gilbert Estate discovery well for the Gilbert Ranch field, Sara Miles Survey, has hole clean to 6,291 ft. now with nearly 3,000 ft. of drill pipe left in the hole.

Pan American Production Co. staked location for its 1 Callihan Unit, a 12,000-ft. wildcat test in a 320-acre unit in the Angier, Hall, Bradley Survey, Abstract 6, 1½ miles southeast of Liverpool townsite, in Brazoria County. Test is 330 ft. from northeast and 418 ft. from northwest line of Lot 2 of the Callihan Subdivision of Tract 8, and is west of the Chocolate Bayou field.

Twelve new locations were reported this week with three wildcats being one each in Brazoria, Harris, and Jefferson counties. The 10 completions included 5 oil wells, 5 dry holes, with 1 new sand in Fort Bend County, and 1 dry wildcat each in Fort Bend and Wharton counties.

UPPER GULF COAST TEXAS SUCCESSFUL WILDCAT

Fort Bend County: New oil sand Needville field—W. L. Goldston 5 E. C. Farmer, Robert Hodge Survey, Abst. 33, top sand 6,680 ft., perforations 15 holes 6,675-78 ft., TD 6,700 ft., PT 146 bbl. per day through a ⅛-in. choke, gas-oil ratio 560 to 1, tubing pressure 1,160 lb., gravity 28°, no water.

UPPER GULF COAST TEXAS WILDCAT FAILURES

Fort Bend County: Quintana Pet. Co. 1 Tabbs Bay Oil Co. et al, Robert Peebles Survey, 2 mi. S of Thompson townsite, dry, TD 7,498 ft.

Wharton County: Seaboard Oil Co. of Dela. 1 M. T. Wehrmann, ETRR Sur., Section 69, Abst. 128, 1 mi. S of El Campo field production, dry, TD 7,515 ft.

APPALACHIAN FIELD

Large Gas Well Completed In Logan District

PITTSBURGH.—In Logan district, Logan County, West Virginia, Columbian Carbon Co. completed the largest Big Lime gas well in recent months in No. 823 Island Creek Coal Co. which gaged 13,127,000 cu. ft. gas, natural, with the Big Lime topped at 2,060 ft. Additional wells are drilling on this tract.

In Dry Fork district, Tucker County, Ohio Oil Co. is continuing testing the Oriskany gas well on the Kuykendall Unit which gaged 3,773,000 cu. ft. gas from the Oriskany sand at 8,305-80 ft., or the bottom part of the sand. The well was killed with water pressure and plugged at 8,305 ft. and the casing perforated 8,250-8,305 ft. That portion of the Oriskany sand was acidized with a resultant gage of over 1,000,000 cu. ft. gas. The well has again been killed and the Oriskany gas plugged off to perforate the casing at several points where there were good gas showings in the upper Devonian shales.

During the week eight new locations were announced scattered in Union district, Barbour County; McComas district, Cabell County; Center and Sherman districts, Calhoun County; Henry district, Clay County; Center district, Gilmer County, and Simpson district, Harrison County.

In Fairfield Township, Westmoreland County, southwest Pennsylvania, Peoples Natural Gas Co. are running 7-in. casing to 7,074 ft., or 1 ft. on the Onondaga chert, in the Oriskany test on Camilla Giffin farm.

In Beaver Township, Crawford County, Appalachian Development Co. has made a location for a test on the W. J. Bittle farm and is rigging up the tools. In Greene Township, Erie County, this company is drilling at 1,796 ft. in the test on the Alfred Halm farm with a surface elevation of 1,317 ft.

During the week three new locations were announced located in Centerville Boro and in Twilight Boro, Washington County, and Washington Township, Indiana County.

PERMIAN BASIN

Fourth Pay Horizon Tapped In Andrews County

MIDLAND.—Sun Oil Co. 2 N. C. Martin, Section 17, Block A-41, Public School Land Survey, has assured a fourth pay horizon for the Martin pool of southern Andrews County. This is the fourth well to be drilled in the field.

It is on the west side of the pool, a west offset to the discovery, producing from the Clear Fork, and a north offset to the Simpson discovery. On a 3-hour drill-stem test of the Silurian topped at 7,940 ft. gas came to the surface in 29 minutes and 1,100 ft. of 43.1°-gravity oil and 100 ft. of drilling mud cut with oil was recovered. The test has been shut down pending decision as to whether it will be completed in the present zone or be deepened. It also showed for production in the discovery horizon and basal Permian.

Shell Oil Co., Inc. and The Texas Co. 2 Ratliff & Bedford, Section 4, Block 73, Public School Land Survey, second well to be drilled in the Bedford pool of southwestern Andrews County and southeast offset to the discovery well which produces from the Devonian and Ellenburger, has proved production in Devonian. On a 180-minute drill-stem test from 9,675-95 ft. there was gas to the surface in 60 minutes, water blanket in 64 minutes, mud, water and oil in 90 minutes. The well flowed clean oil in 120 minutes. It was turned into tanks, making 54 bbl. of oil in the last hour of the test.

Texas Pacific Coal & Oil Co. 1 Brown & Altman, Section 25, Block B-5, Public School Land Survey, Holt lime discovery in the Emperor Deep pool of Winkler County, after treatment with 1,500 gal. of acid kicked off and flowed 16 bbl. of oil per hour, 1 per cent basic sediment and acid residue. Test was through perforations from 4,765-4,810 ft. The well has been shut in to build tank battery and complete. Stanolind Oil & Gas Co. and Westbrook-Thompson 35-A Hendrick, Section 33, Block 26, Public School Land Survey, wildcat in the Hendrick pool, Winkler County, ran a 1-hour test from 9,018-9,223 ft. and recovered water blanket and 390 ft. of drilling mud with no shows.

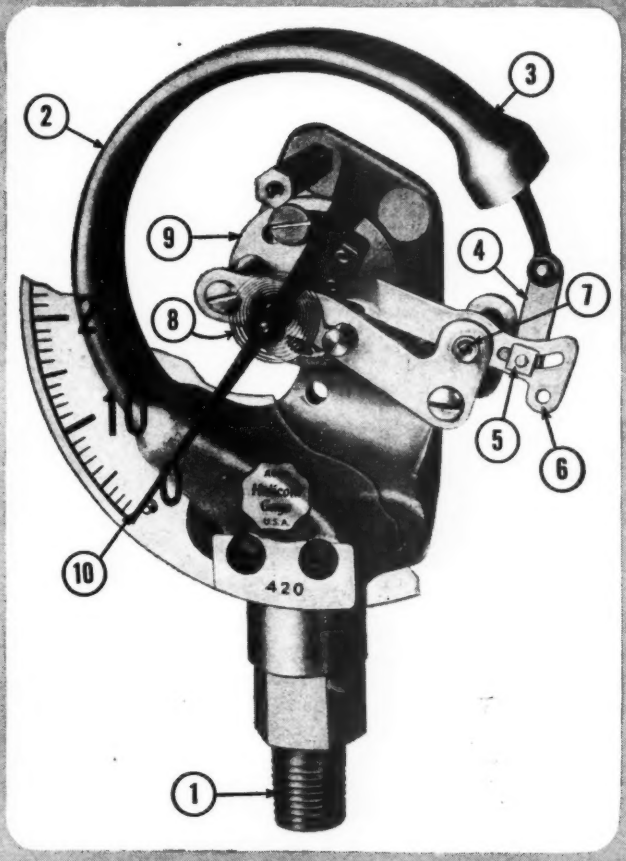
Phillips Petroleum Co. has staked an outpost to the TXL Ellenburger pool of western Ector County. The test is 1¼ miles north of the nearest Ellenburger production. It is 1 Alma, 667 ft. from the west line and 2,003 ft. from the south line of Section 42, Block 45, T-1-N, T&P Survey. Texas 29 Connell, Section 9, Block B-16, Public School Land Survey, wildcat 2 miles west of the Penwell field, Ector County, which failed in pre-Permian formations to 9,675 ft., was cleaning out after shot with 200 qt. from 3,535-75 ft. in the regular Penwell pay horizon. Stanolind 1 Eva B. Kayser, Section 34, Block 43, T-2-S, T&P Survey, wildcat west of the South Cowden pool, Ector County, has been drilled to 10,968 ft. in the Pennsylvanian black shale.

Fullerton field, Andrews County, and Keystone-Ellenburger, Winkler County, each reported two completions this week. Wasson field, Gaines and Yoakum counties, had four locations, McCamey field, Upton County, TXL field, Ector County, Welch field, Dawson County, and Garza field, Garza County, each had two. Keystone-Ellenburger field has 36 drilling wells; TXL field, Ector County, 36; Fullerton field 25; Block 31 field, Crane County, 21 and Welch field, 15.

WEST TEXAS WILDCAT FAILURES

Crockett County: Ben Banner 1 Shannon

How the Helicoid Gage Works



PRESSURE enters the socket **(1)** connected to pressure source. Pressure to be measured may be air, steam, water, oil, or any liquid or gas. Thru socket, the pressure enters Bourdon tube **(2)**.

BOURDON TUBE **(2)** is an oval-shaped tube of semi-circular form with a sealed end **(3)**. Any pressure in the tube, in excess of external or atmospheric pressure, causes tube to assume a more circular cross section. The flat sides are therefore forced apart, and the tube tends to straighten out at the free end, and tip **(3)** moves outward. The reverse effect occurs under vacuum, when the pressure in the tube is less than the external or atmospheric pressure. This movement of the tube at the free end is called tip travel. In principle, it's just as simple as blowing into a limp glove, causing the fingers to move as they fill with air. As the tube tends to straighten, the tip **(3)** moves outward. On vacuum (pressure below atmospheric) the tip moves inward.

CONNECTING LINK **(4)** connects the tip of Bourdon tube to movement slide nut **(5)**. The tip end of the link travels in a straight line while the movement cam **(6)** travels in an arc around pivot **(7)**.

MOVEMENT SLIDE NUT **(5)** which joins the connecting link **(4)** to the movement cam **(6)** is adjustable, and is used for calibrating gage. Lengthening or shortening distance of slide nut **(5)** from pivot **(7)** is necessary to get exact relationship required to translate the travel at the tip to a 280° revolution of the pointer shaft. Moving the slide nut outward decreases amount of travel of pointer. Moving slide nut inward increases the pointer travel. The Helicoid movement is made with this adjustment at the rear. Hence, the Helicoid Gage can be calibrated as a unit by removing the entire system from the case, but without removing the pointer and the dial. This saves much time when calibrating.

CAM **(6)**, which is toothless, in contact with the Helicoid roller of the movement, multiplies the tip travel into rotary motion of the pointer shaft. A tip travel of 3/16" is multiplied to a scale length of 10" on a 4½" dial. Positive and practically frictionless motion is assured by the rolling action of the polished cam surface on the polished Helicoid roller.

HAIRSPRING **(8)** holds the lower surface of the roller groove in continuous contact with lower surface of the cam facing. Both of these surfaces are polished.

BOTTOM PLATE **(9)** of movement is rotatable. Rotating this movement changes the relationship between the direction of the tip travel and direction of travel of connecting link. This relationship must be such that every increment of movement of the tip is translated into uniform increments of angular rotation of the cam, and hence equal increments of travel of the pointer. The rotary feature of this movement is advantageous when calibrating the gage.

POINTER **(10)** travels uniformly around dial for equal changes in pressure, if the gage is in calibration.

The gage shows the difference between pressure in the gage system and atmospheric pressure, commonly known as gage pressure in contrast to absolute pressure. Zero mark on dial represents atmospheric pressure, about 14.7 p.s.i. absolute at sea level. A vacuum gage shows the difference between atmospheric pressure and that pressure to be measured below atmospheric.

(This is page 3, of the new Helicoid Gage catalog. Send for a copy.)

ACCO

TRADE MARK

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BRIDGEPORT 2, CONNECTICUT

Est., Richard Pillow Sur. No. 1, 5 mi. NE Noelke pool, elev. 2,580 ft., dry in San Andres, TD 2,501 ft.

Fisher County: Grapeland Oil 1 C. F. Brooks, Sec. 80, Blk. 1, H&TC Sur., elev. 2,007 ft., dry at 5,113 ft.

Floyd County: Livermore & Honolulu 1 H. A. Krause, Sec. 29, Blk. K, TTRR Co. Sur., elev. 3,196 ft., Mississippin 7,680 ft., pre-Cambrian 7,838 ft., dry at 7,843 ft.

Lubbock County: Kerlyn Oil Co. 1 J. A. Fetter, Sec. 17, Blk. CB, C&MRR Sur., 10 mi. SW Lubbock, elev. 3,321 ft., San Andres 3,860 ft., Glorietta 5,480 ft., dry at 6,889 ft.

Schleicher County: Geo. P. Livermore et al 1 Henderson, Sec. 78, Blk. 1, GH&SA Sur., 4 mi. NE Paige gas field, elev. 2,243 ft., dry in Pennsylvanian, TD 6,505 ft.

Winkler County: R. R. Harrell et al 1 Humble-Burton-Lingo Co., Sec. 27, Blk. 27, PSL Sur., 9 mi. W Kermit, elev. 2,863 ft., Delaware 5,150 ft., dry at 5,156 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Barney Cockburn will drill a deep test on the southeast side of the Maljamar field, west central Lea County, where production is from 4,000-4,200 ft. The new test is scheduled to explore to 6,000 ft. or deeper. It is 1 Corbin, C NE NE 4-18s-33e.

A quarter of a mile north, Cockburn 1 Wyatt, 33-17s-33e, was cleaning out at 4,800 ft. after a 1,190-qt. nitroglycerin shot from 4,600-5,350 ft. Swabbing was under way with fluid standing 1,000 ft. from the top. The test headed 40 to 50 gal. of oil each time the swab was pulled. The test had a bad fishing job at 7,044 ft. and after being shut down for several months plugged back to 5,350 ft.

Caprock field, Lea and Chaves counties, had two completions this week, and Penrose-Skelly and Langlie-Mattix fields, Lea County, each had one. Grayburg-Jackson field and Fren field, Eddy County, each had one location. Lea County has 34 drilling wells with eight wildcats. Eddy County has 21 with 10 wildcats.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURE

Chaves County: Yates, Continental and Miller 1 Mullis, 21-15s-29e, 20 mi. NE Artesia, elev. 3,809 ft., Glorietta 3,838 ft., Yeso 4,000 ft., dry at 5,675 ft.

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SOUTHWEST TEXAS

New Gas-Condensate Pool Opened by Sterling Well

CORPUS CHRISTI.—A new gas-condensate pool has been opened in Victoria County, 7 miles east of the townsite of Nursery, by Sterling Oil & Refining Co. 1 J. J. Welder, in S. A. Belding Survey, Abstract 141. Drilled to a total depth of 5,750 ft. with 5½-in. production pipe set on bottom, operators perforated the sand section from 5,690-5,710 ft. Test flowed through a ¼-in. choke with 2,250 lb. pressure on tubing and 2,350 lb. pressure on casing. Well has now been shut in for installation of separator. Operators have requested that the newly opened area be designated as Welder Ranch.

Mills Bennett 1 Martha Berger et al, a new gas-condensate field opened in Bee County, 2 miles southwest of Tuleta, flowed 8 bbl. of condensate per hour on completion test through a ¼-in. choke, with 6,000,000 cu. ft. of gas per day and 3,800 lb. working pressure, 4,000 lb. shut-in pressure. Production is through perforations in the Luling sand from 8,082-8,140 ft. This discovery is in the Ragley Subdivision in J. M. Uranga Grant. Total depth is 8,890 ft., with 7-in. casing set to 8,000 ft. and 5-in. liner at 8,890 ft. All tests made in the Wilcox zone flowed salt water. The Slick sand logged 48 ft. of pay, and on test from 7,896-7,905 ft. in open hole indicated condensate.

New pay sand has been opened by second test in Violet field, Nueces County, by Phillips Petroleum Co. 2 Wm. Heuermann, located ½ mile northeast of the 1 Heuermann discovery well. Drilled to a depth of 8,118 ft. where drill pipe stuck, operators plugged back and completed in sidetracked hole bottomed at 7,424 ft. On completion test flowed 11 bbl. of condensate per hour and 2,500,000 cu. ft. gas per day through a 3/16-in. choke, with 2,325 lb. working pressure, through perforations from 6,939-42 ft.

A 6,000-ft. northeast extension to the South Cabeza Creek field oil production in Goliad County is being completed at Jay Simmons 1 Mary Poehler. Located in the Jacob Fifer Survey, this well is being completed in the regular pay with perforations from 8,324-25 ft. Top of sand at 8,310 ft. Total depth is 8,328 ft. with 5½-in. casing set on bottom.

In Gonzales County, 3½ miles southeast of the townsite of Waelder, Amerada Petroleum Corp. 1 Henderson, wildcat test in James Gibson Survey 31, Abstract 47, was installing christmas tree after running 7⅝-in. casing at 8,773 ft., total depth. Two drill-stem tests failed when the packer failed to hold.

Another wildcat in Gonzales County is the Quintana Petroleum Corp. 1 Anna Spahn, 4 miles northwest of Gonzales townsite. Total depth is 10,843 ft. with 5-in. liner on bottom. Tests through perforations in the Cotton Valley from 10,495-10,505 ft. recovered a small amount of oil. Operators are reported plugging back to test higher.

Tom Graham 1 Martinez wildcat, in the Alta Mesa area of Brooks County, is coring ahead from 7,528 ft. in shale after coring shale and sand with oil odor from

7,314-15 ft., and sandy shale with gas odor from 7,315-35 ft.

There were 25 new locations reported this week, 8 being wildcats, 2 in Starr, 1 each in Bee, Bexar, Gillespie, Live Oak, and Milam counties. Of the 26 completions only 3 were wildcats, 1 each in Starr, Travis, and Zapata counties.

SOUTHWEST TEXAS WILDCAT FAILURES

Starr County: Zimmerman & Garcia 1 M. M. Garcia, Survey 918, W of Rincon field, dry, TD 4,258 ft.

Travis County: E. R. Marts 1 M. H. Deats, J. F. Webber Sur., 1 mi. SW of Webberville, dry, TD 935 ft.

Zapata County: M. L. Massingill 1 Serapio Vela Est., Porcion 28, Ysabel Gonzales Grant, dry, TD 3,510 ft.

N. CENTRAL TEXAS

Ellenburger Pay Found In Sivalls Bend Pool

WICHITA FALLS.—Standard Oil Co. of Texas 2 Beasley, J. McKerley Survey, the first well to be carried to the Ellenburger in the Sivells Bend pool of northern Cooke County, has been completed to flow 42 bbl. of 40°-gravity oil in 6 hours through ¼-in. tubing choke. Production is through perforations from 8,905-40 ft. Ellenburger was topped at 8,650 ft. Total depth is 9,158 ft. This is the sixth pay for the field.

Continental Oil Co. 1 Harvey, Block 2886, TE&L Survey, southwestern Montague County wildcat 4 miles west of Bowie, drilled saturated conglomerate from 6,108-18 ft. On a 1-hour drill-stem test of the section lightly oil-cut mud and 55 ft. of drilling fluid was recovered with a show of gas. On a 1-hour drill-stem test from 6,108-46 ft., 1 ft. of oil and 119 ft. of slightly gas-cut drilling mud was recovered. Marble Falls was topped at 6,155 ft. which has so far been dry. Operator was drilling below 6,260 ft. in lime and shale.

DeKalb Agricultural Association, Inc., will drill a 6,500-ft. wildcat 6 miles southeast of Crowell in Foard County. It is 1 Kincaid, 330 ft. from the north and west lines of Isaac Aldridge Survey. Magnolia Petroleum Co. 1 Steele, Section 307, Block A, H&TC Survey, Foard County wildcat 7 miles southeast of Crowell, was drilling below 4,377 ft. in lime.

Standard of Texas 1 Mitchell, J. B. McNair Survey, northern Grayson County wildcat 1½ miles northwest of Sherman, was drilling below 6,245 ft. in shale. Denver Producing & Refining Co. 1 Jewell, Block 15, William Allen Survey, another northern Grayson County wildcat between Sherman and Gordanville, was drilling below 9,218 ft. in white lime.

Electra Field, Wichita County, reported eight completions this week and Gatewood field, Cooke County, three. Wilson field, Cooke County, had four locations, Gatewood field three, and Hildreth field, Montague County, two. Cooper field, Archer County, has seven drilling wells, Sivells Bend and Gatewood fields, Cooke County, each has six, and Knox and Lupton fields, Young County, each have five.

In West Central Texas the first Ellenburger oil production for Palo Pinto County has been opened by Ashland Oil & Refining Co. 1 S. F. Lee, Block 1744, TE&L Survey, 2 miles northwest of Graford. It was completed to pump 75 bbl. of oil daily through perforations from 5,038-46 ft.

Shackelford County Regular field reported four completions and four locations this week. Stephens County has six drilling wells, Cisco field, Eastland County, has three, and Loving field, Stephens County, and Reddin field, Taylor County, each have two.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Bridwell Oil Co. 1 Mrs. M. H. Ingersoll et al, Sec. 1, SPRR Sur. A-434, 7 mi. S and 1½ mi. W Mankins, elev. 1,110 ft., dry at 1,649 ft.

The Louisiana Land & Exploration Co. 1 J. D. Lyles, Sec. 7, Hooper & Wade Sur., 5 mi. SW Mankins, elev. 1,153 ft., Campbell 5,052 ft., Ellenburger 5,188 ft., dry at 5,222 ft.

Clay County: NuEnamel Oil Oper. Co. 1 Hapgood, Sec. 83, Marion CSL Sur. A-308, 10 mi. SE Henrietta, elev. 945 ft., dry in Ellenburger, TD 7,023 ft.

Montague County: Bridwell Oil Co. 1 L. D. Childress, R. H. Grimes Sur., 5 mi. N and 1½ mi. E St. Jo., dry at 3,290 ft.

NuEnamel 1 W. L. Admire, G. W. Fisher Sur. A-1223, 3 mi. N Bonita, elev. 990 ft., Simpson 5,625 ft., dry at 6,213 ft.

Wichita County: W. H. Hammon 1-B Fossett & Tuttle, Cherokee CSL Sur. A-33, 3 mi. W Wichita Falls, elev. 969 ft., dry at 6,195 ft.

National Asso. Pet. 1 P. G. Krohn, Sec. 288, Waggoner Colony Subd., 4 mi. NE Electra, elev. 1,115 ft., Ellenburger 3,525 ft., dry at 3,618 ft.

National Asso. Pet. 1 Willie Proud et al, Sec. 189, Waggoner Colony Subd., 3 mi. NW Electra, elev. 1,154 ft., Ellenburger 4,497 ft., dry at 4,561 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCAT

Taylor County: New oil pool—West Central Drilling 1 J. R. Ingram, Subd. 18, Grimes CSL Sur., 3½ mi. SE Merkel, elev. 1,898 ft., pumped 54 bbl. day, perf. 2,740-41 ft. Hope, gravity 40°, gas-oil ratio 60 to 1, TD 3,103 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Callahan County: E & L Oil Co. 1 J. F. Dyer, BBB&C Sur., Sec. 135, 1½ mi. E Baird, elev. 1,934 ft., dry at 830 ft.

R. F. St. Johns 1 S. B. Estes, Sec. 40, BBB&C Sur., 4½ mi. NW Clyde, elev. 1,963 ft., dry in Swastika, TD 1,955 ft.

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Shackelford County: Jones, Stasney & Roark 1 T. W. Lee, Sec. 826, TE&L Sur., 3¼ mi. E Albany, elev. 1,305 ft., dry at 748 ft.

Taylor County: Alder Oil Co. 1 J. S. Hughes Est., Burr & Caswell Sur., 3½ mi. S Merkel, dry in Swastika, TD 2,902 ft.

MICHIGAN

Four Producers Added To Deep River Field

SAGINAW.—With Arenac County's Deep River oil pool well defined on three sides, current operations are expected to determine within a few weeks whether it will continue to extend southeasterly. Field operations in the past week added four more producers to the field as a total of 13 completions for the state were recorded. There was only one other producer, a meager one, and eight dry holes, including two wildcat failures. Only six new locations were announced, two in Isabella County, one each in Allegan, Mecosta, Montcalm, and Tuscola. The new Deep River wells came in for daily potentials of 4,200, 3,740, 1,560, and 30 bbl. The other producer is one pumping 5 bbl. a day in Georgetown of Ottawa. Three of the dry holes were Bay County tests, including one in the Kawkawlin field that Gulf Oil Co. deepened to 2,937 ft., found a small amount of oil and then turned into a brine disposal unit.

MICHIGAN WILDCAT FAILURES

Allegan County, Heath Township: Leonard C. Sleep 1 Hansen, SW SW NE 7-3n-14w, dry in Traverse limestone, TD 1,508 ft.

Missaukee County, Reeder Township; Union Drilling & Producing Co. 1 Weidler-Vandermuelen, NW NW SE 34-22n-7w, dry hole, TD 1,406 ft.

1945 Edition

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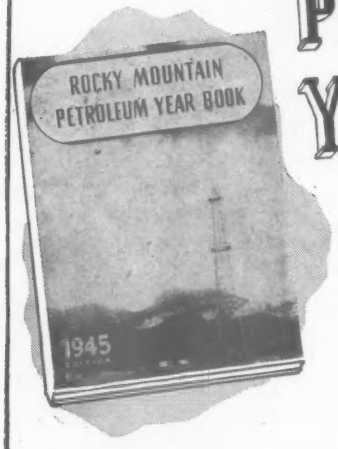

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CALIFORNIA

Eocene Sand Reported In Test at Jacalitos

LOS ANGELES. — According to reports,, Standard Oil Co. of California has found an oil sand in formations of Eocene age in 54 Ferguson at Jacalitos but the well has not been completed due to an unsuccessful water shutoff. Standard has declined to release data on this well. A formation test was made and while the results are not available, the company immediately landed a string of 7-in. casing at 7,781 ft. The Eocene oil sand found between 7,727 ft. and 7,779 ft. appears tight but looked good enough to justify the expectation of a successful completion.

This wildcat, the first Eocene test drilled since the discovery of Jacalitos, opens the possibility of deep sand production along the Jacalitos anticline. Production was developed by Wilshire Annex Oil Co. at Jacalitos in a 40-ft. Temblor sand of Miocene age, and all wells have been finished in this horizon. Standard's test is the most southerly exploratory well drilled.

The Eocene has been found productive at Kettleman North Dome, Coalinga Nose and Pleasant Valley, all in the vicinity of Jacalitos. Jacalitos also has an inviting anticlinal structure. A successful completion by Standard on the Ferguson propery would suggest the existence of Eocene production between Jacalitos and East Coalinga where a number of Temblor sand wells already have been finished.

The Edison and McKittrick fields of Kern County in the San Joaquin Valley continue to yield flowing wells although operators only produce a portion of their potentials. At Edison, operators are drilling new wells and deepening old pumping wells. Current production is 13,100 bbl. daily as compared with 3,824 bbl. last year despite present restrictions. Schist production has been found beyond the limits of the older zones, especially to the southeast and northwest. Peak production may be a month or two away depending upon the amount of drilling and back pressure.

Subsurface formations make drilling rapid, and wells are being completed in about 2 weeks. McKittrick production has increased from 4,900 bbl. last year to 8,950 bbl., and should soon exceed 10,000 bbl. daily. This increase is largely in the Cymric section, which has been designated as the Brunt and Anderson sections. Correlation work is difficult in this area, and together with the fact some operators are withholding data precludes an evaluation of each sand's importance. On the basis of well initials all sands look good, but inspection reveals some sand bodies are thin and may not sustain high production rates. Well pressures are declining and a rapid drop in production may follow peak production. The Cymric section has been producing for a number of years, but only within the past 2 years has additional acreage been proved. Consequently, the Cymric is producing more today than at any time in the past.

Seaboard Oil Co. which is drilling a deep well in the Buena Vista Lake area jointly with several other operators, is coring for the second Stevens sand which if found and proved productive will open up a new field slightly northwest of the Paloma field. The upper Stevens of Miocene age was cored at 10,982-11,001 ft. but it consisted of a barren tight gray sand. The lower Stevens should be encountered soon if the company recovers from a fishing job at 11,243 ft.

Development work continues at a conservative rate in the Paloma field but there is a trend away from unitization by operators holding productive and potentially productive acreage outside the unit in the north. It had been thought probable that all but one operator would become members, but as long as this operator re-

fuses to join the program others feel they must protect their leases. Paloma presents two conditions of importance. The gas cap area produces a white oil or condensate at a high gas-oil ratio while the northern section of the field and farther down the flank produces a normal black oil under a more favorable ratio. Complete unit operation would increase ultimate recovery and retard edgewater encroachment in the black oil zone with increased production of black oil. With continued operation, the gas cap area will expand and as gas-oil ratios increase and the volume of gas increases, recovery will decrease.

CALIFORNIA WILDCAT FAILURES

Kern County, Round Mountain: U. S. Drilling Co. 1 Olcese, 17-28s-29e, bottomed in hard gray sand, upper Vedder of Miocene age, was barren at 2,345 ft., lower Vedder missing, TD 2,600 ft.

San Emidio: Western Gulf 2 Los Lobos, 4-10n-22w, bottomed in hard gray sand, only minor showings logged, TD 4,189 ft.

Los Angeles County, Los Angeles City: Dumm Brothers 16 City, 29-1s-12w, bottomed in hard gray sand, no showings, TD 4,988 ft.

Tulare County, Goshen: W. C. McDuffie 1 Bennett, 15-18s-23e, bottomed in hard barren shale, no showings of importance logged, TD 4,050 ft.

ROCKY MOUNTAIN

Cut Bank Field Has Second Madison Lime Producer

DENVER.—A second producer in the Madison lime in the northern area of the Cut Bank field in Montana has been completed in Carter Oil Co. 1 Larmon, C SE NE 12-36n-6w, at a total depth of 3,075 ft. Flowing through a ¼-in. choke it made 3 bbl. of oil per hour for 16 hours, then 70 bbl. in 24 hours and 68 bbl. in the next 24 hours. It is a south offset to Carter's 1 Brindley, the discovery well in the Madison, which was completed last fall for 122 bbl. in 21 hours on a swabbing test at 3,087 ft. The oil tested 37° gravity. Cut Bank production comes from the Sunburst and Cut Bank horizons and only two or three tests had been drilled deeper to the Madison prior to the completion of the Brindley well. Several wildcats drilling or getting under way at widely separated intervals are expected to throw considerable light on the extent of the new pool. Pettie-Stewart-Inland 1 Downing, C SW SW 30-37n-5w, 2 miles due north of the Brindley discovery, is drilling below 1,900 ft. and will be an early completion. Union Oil Co. has made a location for 1 Stufft, C SW NW 19-36-5w, 2 miles to the south. Inland Empire Refining Co. is rigging up in 1 Cross, SE SE NW 11-37-5w, 8 miles northeast of the two producers. Union Oil Co. 4 Langenbeer, NW NE NW 18-35-5w, 8 miles south of the Brindley discovery, recently tested the Madison at 3,065-3,130 ft., and had only a trace of oil. Carter's 1 Larmon, the producer completed the past week, had the top of the Madison at 3,046 ft. and picked up the saturation at 3,063 ft., continuing to 3,073 ft. Elevation is 3,986 ft.

Rangely outposts.—Continental Oil Co. 1 Rooth, C NW SW 15-2n-103w, which extends the Rangely field in Colorado 1½ miles to the northwest and adds approximately 6,300 acres to the potentially proven area, kicked off without swabbing after plugging back 11 ft. to shut off bottom water, and when turned into the tanks flowed 36 bbl. of pipe-line oil per hour through a 1-in. choke on the tubing. This was at the rate of 864 bbl. per day, or considerably above the field average. A grind-out of samples from the bottom showed 4.2 per cent basic sediment, but no free water, and is expected to clear

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up. Production is coming from 224 ft. of the Weber section.

Algord Oil Co. 1 Guiberson, C SE NE 18-2n-102w, Rangely outpost ⅛ mile north of nearest producer, is setting plastic plug to shut off bottom water at 6,575 ft., total depth. Last test before plugging back it flowed 248 bbl. of fluid in 24 hours through a 3/8-in. choke, of which 16 per cent was basic sediment and water, the latter amounting to 6 per cent. Tubing pressure was 100 lb., and casing pressure 420 lb. Location has been made for 2 Guiberson, C NE NE of Section 18, ¼ mile to the north.

Crook's Gap extension.—The Crook's Gap field, Fremont County, Wyo., a discovery in the Lakota sand in 1944 by Sinclair-Wyoming Oil Co., has been extended a mile to the southeast in General Petroleum Corp. 72-19 Pat., SW NE NE 19-28n-92w. It was completed in the Lakota at 5,218-54 ft., and flowed 200 bbl. net first 24 hours. Sinclair-Wyoming previously had completed four wells in the field, including the discovery. The latter flowed 1,478 bbl. of 36.2°-gravity oil in 24 hours. A west offset made 2,687 bbl. in 15 hours or at the rate of 4,300 bbl. per day. A triangle offset on the north of these two wells was drilled to 8,733 ft., testing lower horizons, and was abandoned. The fourth well, two locations south of the discovery, flowed 3,817 bbl. in 24 hours.

Cat Creek Ellis sand extended.—Continental Oil Co. 12 Brown, SE NE SE 17-15n-30e, Cat Creek field, Montana, was completed at 1,525 ft., 25 ft. in the Ellis, flowing 197 bbl. in 24 hours. It extended the new Ellis pay ¼ mile to the north of 10 Brown, which flowed 100 bbl. in 16½ hours. A second well drilled ¼ mile west of 10 Brown made only 24 bbl. per day. The 12 Brown then was drilled 1,320 ft. north of 10 Brown to test out the theory of a fault running between the two wells and resulted in a better well.

Discovery at Rattlesnake Butte.—H. H. Schwartz, Jr. 1 Government, C SW SE 22-13n-28e, Petroleum County, Montana, a wildcat on the Rattlesnake Butte structure, 15 miles south of the Cat Creek field, joint with Dave Schrock and E. J. McKenna, is a discovery in the second Cat Creek sand at 2,780-2,816 ft. The test was drilled to 3,235 ft., and plugged back after finding water in the third Cat Creek and Ellis sands. Sixteen feet of the second Cat Creek was cored, but the section lacked porosity except for 3½ ft. From the porous section it swabbed 4 bbl. per hour of 32°-gravity crude. Rotary is being moved out and a spudder moved in to shoot and complete. The well is on a block of 5,920 acres held by these interests, of which 880 acres is federal land. The structure is highly faulted.

New depth record.—Mountain Fuel Supply Co.-Union Pacific Railroad Co. 1 Government, C SW NW 8-16n-112w, Church Buttes district, Uinta County, Wyoming, established a new depth record the past week for the Rocky Mountain area. It is now drilling below 12,812 ft., and superseded the record of the Texas-California test at Wilson Creek, Colo., which went to 12,702 ft., and is now plugging back and testing.

New operations.—Ten new operations were reported, of which two were in the Rangely field in Colorado; one each in Lance Creek and Rock River, in Wyoming: two in Kevin-Sunburst and one each in North Cut Bank, Cut Bank, and Cat Creek, in Montana, and one in San Miguel County, New Mexico. Three are wildcats and one is an outpost well at Rangely.

Completions.—Seventeen wells were completed, of which 10 were oil wells with initial production of 2,176 bbl., 1 was a small gas well, and 6 were dry holes. These were distributed, 3 oil wells in Rangely, Colo., for 1,480 bbl.; 7 in Wyoming, of which 2 were oil wells for 320 bbl., 1 was a gas well and 4 were dry; 7 in Montana, of which 2 were oil wells for 376 bbl., and 2 were dry holes. Eight for the area were wildcats, including four extensions of proven fields and four were dry holes.

COLORADO SUCCESSFUL WILDCAT

Rangely, Rio Blanco County: Continental Oil Co. 1 Rooth, C NW SW 15-2n-103w, TD 6,816 ft., PB 6,805 ft., flowed 36 bbl. per hour from Weber sand, top at 6,320 ft., through 1-in. choke, extension 1½ miles northwest.

WYOMING SUCCESSFUL WILDCAT

Crook's Gap, Fremont County: General Petroleum Corp. 72-19-Pat., SW NE NE 19-28-92w, TD 5,600 ft., redrilled to 5,254 ft., top Lakota 5,218 ft., 7-in. 5,240 ft., flowed 200 bbl. in 24 hours, extension 1 mile southeast.

WYOMING WILDCAT FAILURES

Airport Area, Natrona County: Dyer & Hays 1 Midert, SW SW SW 26-35n-80w, TD 1,882 ft. in Frontier.

Jewell Springs, Platte County: Jewell Springs Co. 1 Berry, C NW NW 20-30n-67w, TD 1,775 ft. in pre-Cambrian.

Spanish Diggings: National Associated Pet. Co. 1 Gov't., C SW NE 2-30n-67w, TD 1,900 ft. in Madison.

Steamboat Butte, Fremont County: British-American Oil Producing Co. 6-C Tribal, NW NW SE 19-4n-1w, TD 7,404 ft., top Tensleep 7,322 ft., swabbed 90 bbl. of fluid per day cutting 70 per cent, temp. abd.

MONTANA SUCCESSFUL WILDCATS

North Cut Bank, Glacier County: Carter Oil Co. 1 Larmon, C SE NE 12-36n-6w, TD 3,075 ft., top of Madison 3,046 ft., top of saturation 3,063 ft., flowed 70 bbl. in 24 hours through ¼-in. choke, extension.

Cat Creek, Petroleum County: Continental Oil Co. 12 Brown, SE NE SE 17-15n-30e, TD 1,525 ft., flowed 197 bbl. in 24 hours from Ellis sand, north extension of Ellis sand pool.

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OHIO, KENTUCKY

Recent Completions May Bring Additional Drilling

COLUMBUS.—Two wells drilled in this week will increase the drilling in the already active area north of the Clayton pool. Preston Oil 1 J. E. Madden, Section 21, Madison Township, Perry County, filled up 1,600 ft. with oil in 12 hours and will be shot. Clinton was found at 3,107-50 ft. In Newton Township, Muskingum County, Pure Oil 1 H. C. Eppley, Section 26, had 2,330,000 cu. ft. of gas at 33 ft. in the Clinton, topped at 3,417 ft. This well is expected to open up a limited gas pool.

The North Bloom Township gas pool in Morgan County was extended ½ mile northeast by Stephens Petroleum 1 Ross Robinson, Section 3. Clinton sand was drilled from 4,387-4,417 ft. and gaged 4,000,000 cu. ft. natural with 1,000 lb. pressure.

Roy Weed 1 Cleveland Tr. Co., Lot 18, Aurora Township, Portage County, was gaged after blowing open 1 hour at 1,250,000 cu. ft. and rocked to 1,250 lb.

Twenty locations were reported for the week with Cambridge six, Lancaster and Sandyville four each, and Ashland three. Lancaster had 11 of the 29 completions.

OHIO WILDCAT FAILURES

Perry County, Pike Township: Pure Oil 1 Kinsel, Sec. 35, Clinton 3,382-3,435 ft., Medina 3,465-70 ft., TD 3,496 ft.

Tuscarawas County, Washington Township: Wasson 1 J. P. Hursey, Lot 33, Oriskany 3,611-17 ft.

EASTERN KENTUCKY

ASHLAND.—One of the biggest well completions on record here in many months was noted in the eastern Kentucky field of operations during the past week.

The Kentucky-West Virginia Gas Co. shot the well, on the property of Ben Blackburn in Pike County. The total depth was 1,924 ft. and daily open flow was estimated at 5,673,000 cu. ft. of gas in the Big Lime formation.

Another completion was marked by Kentucky-West Virginia Gas on the property of W. H. May in Knott County, total depth 2,865 ft., daily open flow estimated at 60,000 cu. ft. in shale.

WESTERN KENTUCKY

OWENSBORO.—Calstar Petroleum Co. 1 C. Blake, 22-P-20, Union County wildcat about 1 mile northwest of the St. Vincent pool, is cleaning out after an 80-qt. shot in the Cypress sand at 2,290-2,305 ft., total depth 2,650 ft. This well made about 35 bbl. of oil per day before shot.

Location has been staked for a new wildcat in Union County about 2 miles north of Spring Grove. The test is the J. W. Canterbury 1 W. B. Holt, NW SW 12-O-18.

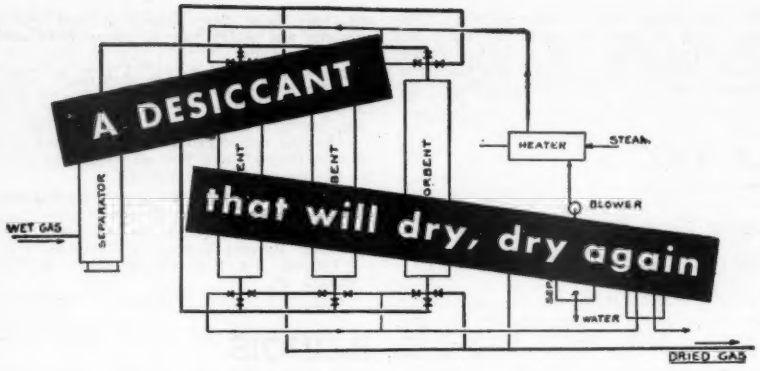
Western Kentucky completions during the week included one oil well and two dry holes, one a wildcat. Only new operations reported were the Union County wildcat and a field well in Henderson County.

INDIANA

EVANSVILLE.—J. Kabana & L. A. Plumb 1 Coleman Community, SW SW NW 7-2s-9w, north outpost of the West Francis pool, Gibson County, is continuing to test the Rosiclare at 1,792-98 ft., total depth 1,969 ft. The well is swabbing at the rate of 10 bbl. of oil an hour and flowing some oil by heads. No pay was encountered in the McClosky.

Substructure is being built for Continental Oil Co. 1 D. Cooper Estate, SW SW 13-3s-14w, Gibson County wildcat, and rotary tools will be moved in within the next few days. The 1 Cooper is a projected Devonian test.

Three oil wells and one dry hole were completed in Indiana during the past week. No wildcat completions were reported. Two



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new operations each were reported for Posey and Gibson counties. In addition, three drilling permits were issued for Posey County, two for Decatur, and one each for Gibson, Jay, Knox and Pike counties.

LA.-ARK.

Deep Gas Zone in Prospect For Haynesville Field

SHREVEPORT.—Ohio Oil Co. may have discovered a deeper gas pay for the Haynesville field, Claiborne Parish, in the 1 Bond Beane Unit, H, in SE NW 22-23n-8w. Salt was found at 9,953-63 ft. when the hole threatened to blow out. After reconditioning the hole, operators drilled ahead to 9,968 ft. Geologists and field men have stated that the zone from 9,953-63 ft., which has a showing of gas, is the deepest horizon in the pool. The present deepest producing level is the Taylor.

Hunt Oil Co. is preparing to test the 1 S. G. Haynes, SE SE 11-23n-10w, North Shongaloo pool, Webster Parish. The well was bottomed at 5,877 ft., and pipe set at 5,849 ft.

North Louisiana had 18 completions. Two wildcats, in Richland Parish and Franklin Parish, were dry. Of the eight gas wells completed, five were in the Lucky pool, two in the Monroe pool and one in the Vixen pool. Big Creek field had two dry holes. Lake St. John added two oil producers; Big Creek, two; Caddo, one, and Delhi, one.

The Haynesville extension test in Arkansas yielded water and a slight show of oil on a drill-stem test. The well, Skelly Oil Co. 1 Myrtis Pipes Unit, 1,103 ft. north and 660 ft. east of southwest corner of 26-19-20, was perforated at 5,632-48 ft. Perforations have been squeezed and preparations are under way to reperforate and test same zone.

The McAlester Fuel Co. A-1 Z. P. Duncan, SE NW 10-17-19, made 55 bbl. oil and 75 per cent salt water per day after well was recompleted. Total depth is 7,140 ft.

Arkansas had three completions; one dry hole in Wesson, and two oil wells, one each in Village and Champagnolle.

NORTH LOUISIANA WILDCAT FAILURES

Franklin Parish: F. B. King 1 Baskin Est., SE NW SW 35-16n-7e, dry at 4,005 ft.

Richland Parish: Bryant & Caraway 1 S. Harrell, SW NW NW 26-16n-7e, dry at 3,613 ft.

ILLINOIS

Storms Outpost Opens Large New Area

MATTOON.—A northeast extension of the Storms pool of White County was assured last week when Sinclair-Wyoming Oil Co. & Ohio Oil Co. 1 E. M. Riecken, SE NW SE 1-6s-9e, showed gas and oil in the Waltersburg. The sand section was encountered at 2,299-2,315 ft., total depth, and on preliminary tests the well made 1,500,000 cu. ft. of gas and 8 bbl. of oil an hour. The 1 Riecken is a ½-mile outpost of the field and opens a large area for development.

A west extension of the Dundas Consolidated field of Richland County has been successfully completed as one of the largest producers in several weeks. It is the J. J. Lynn 1 C. L. Hayes, NE NE NW 12-4n-9e. On initial production tests the well flowed 1,030 bbl. of oil a day from the McClosky at 2,904-11 ft., total depth.

(Continued on page 162)

OKLAHOMA

Lower Formations Show Water in Washita Wildcat

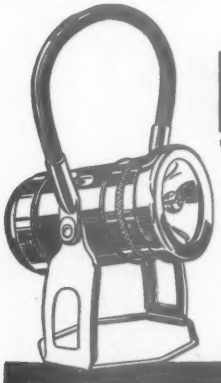
ATLANTIC REFINING CO. 1 Hill, NW NW NW 25-8n-18w, Washita County gas discovery, perforated casing opposite a section 6,445-60 ft. and recovered salt water and fresh water on a drill-stem test. The well had been drilled to a total depth of 6,505 ft., and 5½-in. casing was set 6,488 ft. The 1 Hill previously showed as a gas discovery in the Springer sand, testing 15,000,000 cu. ft. of gas at 6,190-6,231 ft. and 10,000,000 cu. ft. of gas at 6,170-90 ft. Perforations have been squeezed and the well will be plugged back for completion in the Springer pay.

Helmerich & Payne, Inc., 1 Sadler, SE NW NE 28-1n-2e, Murray County wildcat, is reperforating casing opposite the 1,920-ft. sand zone after testing considerable oil through shot holes at 1,920-22½ ft. Following the perforations the hole filled 1,500 ft. with oil and operators were unable to lower the fluid level after swabbing 50 bbl. When the swab was pulled the well showed considerable gas kick. The perforations were then squeezed and the test is waiting on the cement to set.

Stephens Petroleum Co. 1 Pennington, NW NW NW 27-8n-25w, Beckham County wildcat 5 miles north of Erick, is drilling ahead below 1,962 ft. in dolomite. This well attracted some attention during the past week when staining was found in the Panhandle lime, which was topped at 1,810 ft.

The Texas Co. has set 7-in. casing and is bailing mud preparatory to testing the granite wash in its Jackson County wildcat, 1 Hickman, SW NW NW 6-1n-19w, east of the Altus pool. Total depth is 3,017 ft.

(Continued on page 162)



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MISSISSIPPI

Warren County Wildcat To Test Gas Production

JACKSON.—Several shows of oil in cuttings and on drill-stem tests have been passed in the Magnolia 2 Ruth Pidgeon, wildcat, 27-17n-4e, Warren County, and casing is being run to make production test of gas shows, on sand indicated in the Zilpha formation at 2,037-47 ft. The sand, recovered in a core at 2,042-48 ft., is fine and porous with a slight oil stain. Total depth is 2,546 ft.

Carter Oil Co. 1 Reynolds, wildcat in 12-10n-5e, Copiah County, received 15 sidewall cores with no showings. Base Austin was topped at 8,805 ft., Eutaw sand at 9,039 ft., Tuscaloosa at 9,060 ft., Marine Tuscaloosa at 9,732 ft. Operators are drilling below 10,287 ft.

Mississippi had five field well completions with no wildcat completions. Cranfield field had two oil producers and one dry hole; Gwinville field had one oil well and East Heidelberg field added one oil producer.

ALABAMA WILDCAT FAILURE

Madison County: Newman 1 Albert Lam, SW NW NW 10-4s-1e, dry at 930 ft., Trenton lime 345-55 ft., Black River lime 567 ft.

FLORIDA WILDCAT FAILURE

Liberty County: Pure Oil Co. 1 Neal Lbr. Co., 2,600 ft. south and 1,200 ft. east of northwest corner of 33-2s-8w, dry at 4,506 ft., black shale 4,506 ft.

GEORGIA WILDCAT FAILURE

Crisp County: Kerr-McKee Oil Industries, Inc. 1 Cecil Pate, SW/4 Lot 144, Land District 13, dry at 5,008 ft., lower Tuscaloosa 3,087 ft., Massive sand 3,232 ft.

CANADIAN FIELDS

Central Alberta Foothills Test Encounters Fault

CHATHAM.—In the Central Alberta foothills, Home Brazeau Syndicate 1, LSD 5, 17-43-17w5, on the Brazeau structure, faulted back from Madison limestone to upper Blairmore at 11,599 ft. Drilling was halted at 11,689 ft. for directional survey and electrolog. The well got the first Madison contact at 9,489 ft., faulted to Blairmore at 9,597 ft., got a second Madison contact at 11,351 ft. The second lime showed porosity with some indications of oil. It is probable another well will be drilled by the syndicate, representing a group of Calgary companies.

Moose Dome.—On the Moose Dome structure in the Alberta foothills northwest of Calgary, Elbow Falls 2-A, LSD 4, 28-22-6w5, is testing production at 3,158 ft.

Turner Valley.—Two exploratory wells testing a northwest extension of Turner Valley are likely to be abandoned after striking water in the Madison limestone. Home Oil 21, LSD 11, 34-21-4w5, showed Madison at 9,180-9,582 ft. with salt water. Location was 4 miles northwest of the nearest producer. Home 20, LSD 7, 24-21-4w5, with Madison at 9,303-9,771 ft., showed some oil accompanied by water. The company has spudded two new exploration tests farther south on the west flank, Home 22, LSD 16, 32-20-3w5, and Home 23, LSD 7, 5-21-3w5.

Stimson Creek.—On Stimson Creek, in the Pekisko area southeast of Turner Valley, Saskatchewan Co-Op 1, LSD 11, 22-17-2w5, has encountered the Dalhousie sand at 10,455 ft. and is deepening to test the Madison, with contact expected around 10,800 ft.

Quaich.—On the Quaich structure in the Southwest Alberta foothills, Quaich Oil Corp. will drill a wildcat test on acreage of the Globe Oil Co. which holds 7,000 acres blanketing the entire structure in Townships 8, 9 and 10, Range 3w5. The structure was first reported on by E. H. Cunningham Craig but has never been drilled. Toronto, Calgary and Vancouver interests are backing the venture.

KANSAS

Barber County Plug-Back Gets Big Flow in Simpson

SINCLAIR PRAIRIE OIL CO. 1 Oldfather, C SE 7-31-14w, Barber County, an old Arbuckle lime producer on northeast edge of Skinner Northwest pool, was plugged back to the Simpson, and on test, flowed 40 bbl. in 30 minutes before being shut in for tankage. Originally completed as a 200 bbl. well with about 75 bbl. of water in January 1945 from the Arbuckle, the well was plugged back, and perforated for testing. Perforations at 4,515-20 ft. with 7 shots, resulted in nothing; perforations at 4,420-26 ft. with 6 shots brought 500,000 cu. ft. of gas, and reperforating with 12 shots in the interval between 4,422-26 ft. brought a fill-up in 30 minutes and then a 40 bbl. flow in the next 30 minutes.

With an elevation of 1,640 ft., datums reported are Viola —2,694 ft., Simpson —2,776 ft., and Arbuckle —2,914 ft. Present flow appears to be coming from the interval between 6 ft. and 10 ft. below top of Simpson.

Ashland Oil & Refining Co. 1 James, NW SW NE 36-32-2e, looks promising as an oil

(Continued on page 162)

CALENDAR

March

Southern Gas Association, annual convention, Galveston, March 21-22.

Western Petroleum Refiners Association, annual meeting, Blackstone Hotel, Fort Worth, March 25-27.

American Gas Association, conference on industrial and commercial gas, Commodore Perry Hotel, Toledo, March 29-30.

American Institute of Chemical Engineers, regional meeting, Rice Hotel, Houston, March 31 to April 3.

April

New York Nomads, Louis Sherry Hotel, New York, April 1.

Houston Nomads, River Oaks Country Club, April 1.

Society of Exploration Geophysicists, annual meeting Stevens Hotel, Chicago, April 1-2.

FPC regional hearing in natural-gas investigation, House of Delegates Chamber, State Capitol Building, Charleston, W. Va., April 2.

Society of Economic Paleontologists and Mineralogists, annual meeting, Stevens Hotel, April 3-4.

American Association of Petroleum Geologists, annual meeting, Stevens Hotel, Chicago, April 3-5.

Midwest Power Conference, Palmer House, Chicago, April 3-5.

Los Angeles Nomads, Mayfair Hotel, Los Angeles, April 10.

A.P.I. division of production, Pacific Coast district, spring meeting, Biltmore Hotel, Los Angeles, April 11-12.

Interstate Oil Compact Commission, spring meeting, Tulsa, April 11-13.

Natural Gasoline Association of America, annual convention, Baker Hotel, Dallas, April 17-19.

National Petroleum Association, semiannual meeting, Hotel Cleveland, Cleveland, Ohio, April 18-19.

Southwestern Gas Measurement Short Course, Norman, Okla., April 23-25.

A.P.I. directors' meeting, Blackstone Hotel, Fort Worth, April 28.

Independent Petroleum Association of America, midyear meeting, Houston, April 29-May 1.

May

Houston Nomads, River Oaks Country Club, May 6.

Pennsylvania Gas Association, Galen Hall, Wernersville, Pa., May 7-9.

Natural Gas Department, American Gas Association, annual spring meeting, Hotel Gibson, Cincinnati, May 7-8.

National Association of Corrosion Engineers, annual meeting, President Hotel, Kansas City, Mo., May 7-9.

Petroleum Industry Electrical Association and Petroleum Electrical Supply Association, eighteenth annual joint conference, Mayo Hotel, Tulsa, May 7-9.

Los Angeles Nomads, Mayfair Hotel, Los Angeles, May 8.

A.P.I. division of production, Southwestern district meeting, Washington-Youree Hotel, Shreveport, May 17-18.

June

Society of Automotive Engineers, semiannual meeting, French Lick, Ind., June 2-7.

Houston Nomads, River Oaks Country Club, June 3.

A. P. I. division of production, Mid-Continent district meeting, Skirvin Hotel, Oklahoma City, June 6-7.

Kentucky Oil and Gas Association, annual meeting, Hotel Lafayette, Lexington, June 7-8.

Los Angeles Nomads, Mayfair Hotel, June 12.

A.P.I. division of production, spring meeting, William Penn Hotel, Pittsburgh, June 13-14.

American Society for Testing Materials, annual meeting, Buffalo, June 24-28.

July

Houston Nomads, River Oaks Country Club, July 1.

Los Angeles Nomads, annual meeting and party, Mayfair Hotel, July 10.

August

Houston Nomads, River Oaks Country Club, August 5.

September

Houston Nomads, River Oaks Country Club, September 2.

Los Angeles Nomads, Mayfair Hotel, September 11.

National instrument conference, sponsored by Instrument Society of America, William Penn Hotel, Pittsburgh, September 16-20.

October

Houston Nomads, River Oaks Country Club, October 7.

Los Angeles Nomads, Mayfair Hotel, October 9.

November

Houston Nomads, River Oaks Country Club, November 4.

Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa, November 7-8.

A.P.I. annual meeting, Stevens Hotel, Chicago, November 11-14.

Los Angeles Nomads, Mayfair Hotel, November 13.

December

Houston Nomads, River Oaks Country Club, December 2.

Los Angeles Nomads, Mayfair Hotel, December 11.

1947

May

International Petroleum Exposition, Tulsa, May 17-24.

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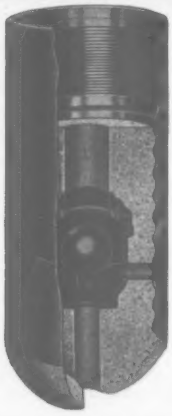

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Among the Drilling Contractors

Sewage Sanitation Co. will drill the Clayton Development Co. 1 George W. Cramer, SE SW SW 15-8s-15w, Ontwa pool, Cass County, Michigan.

Shamrock Drilling Co., McCarthy and O'Brien, Los Angeles, has completed 22 wells for Union Pacific Railroad in the Wilmington field during the past 10 months and should have 23 and 24 completed in another 2 weeks. The company is now running two strings of tools in the Wilmington field.

Merrill Drilling Co. has the contract to drill the J. V. Wicklund Development Co. 1 Joseph Sourek, SE SE NW 15-9n-1w, Elba field, Gratiot County, Michigan.

Hall & Stewart, Midland, Tex., are contractors for J. W. Murchison 1 TXL, C SE NW Section 7, Block 45, T-2-S, T&P Survey, a 8,500-ft. wildcat 4½ miles south of TXL field, Ector County, Texas.

War-Brad Drilling Co. is moving in rotary tools on the Texas Co. 1-B Carter, SE NE SW 13-5n-7e, Clay County, Illinois.

Lupher Drilling Co. will drill the Pure Oil Co. 1 J. J. Wernette, in center of north half NE NE 6-15n-6w, Sherman field, Isabella County, Michigan.

George & Wrather Drilling Co. will drill the Cherry-Kidd 4 Kerwin-Concord, in SW SW SW 21-6s-10e, White County, Illinois.

W. F. Souers Drilling Co. has been contracted by A. S. Reed to drill the 1 Sam Ridgeway in NE SE 35-8n-10w, Sullivan County, Indiana.

Graham Wilcox Drilling Co. will drill the Clarence Wilcox 1 Caroline Mossner in SE SE SW 18-10n-6e, Birch Run pool, Saginaw County, Michigan.

Universal Drilling Co. has the contract to drill a well in the Hope pool, Barry County, Michigan, for William Moser. The well is the 1 William Moser in SE SE NE 4-1n-9w.

Newman Brothers Drilling Co., San Antonio, is rigging up on a 15,500-ft. contract for F. A. Gallery, at the 1 Thompson Brothers, R. O. Lusk Survey, Montgomery County, Texas. The test will go through the Wilcox.

MBK Drilling Co. of Tulsa was liquidated at a meeting in Oklahoma City by representatives of Roeser & Pendleton, Inc., Fort Worth, and Kerr-McGee Oil Industries, Inc., and Big Chief Drilling Co., both of Okla-

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homa City. Each firm acquired 33½ shares of the stock, divided 7 strings of tools, and will offer 6 strings for sale.

Iron Drilling Co., Tulsa, is contractor on the Darby & Bothwell 1 Glass, wildcat test in northwestern Ellis County, Kansas. It is 9 miles northeast of the town of Ellis, 2½ miles west of production in the Soloman pool, and 3 miles southeast of the recently discovered Cromb pool. Contractor was moving in materials.

Harris Oil Co. will drill the Del Fortney 1 C. & M. Gish, wildcat, in SE NE NE 19-1s-14w, Van Buren County, Michigan.

Harbar Drilling Co. will drill two tests for Alfred M. Landon, which will be drilled in Barber County, Kansas. These are the 1 Larkin, in SE SE NW 23-32-15w, and the 1 Gaddis, in SE SE NE 3-31-14w. Both are farmouts from Sinclair Prairie Oil Co.

Thumb Drilling Co. was awarded the contract by E. Edwin Brehm to drill a wildcat in SW SW SW 35-11n-8e, Tuscola County, Michigan. The well is 1 Ernest Stebbins.

Mercury Drilling Co. has the contract to drill the Carthage Unit 112-1, in Panola County, Texas, for British American Oil Producing Co. Contractor is drilling below surface casing on the 1 Roy Wood, in NE NE NE 21-14n-2w, Coffee Creek field, Oklahoma County, Oklahoma. The well, on a Sinclair Prairie Oil Co. farmout, is owned three-fourths by C. U. Bay, of Bay Petroleum Corp., and one-fourth by Mercury Drilling Co.

Dee Drilling Co. will drill the Illinois Mid-Continent 1 Joe Hanley in SW SW SW 5-10n-10e, Cumberland County, Illinois.

Lohman-Johnson Drilling Co. will drill the 3 Hardiman for C. Wood in SE SW NE 27-1s-12w, Gibson County, Indiana.

W. E. Wyse Drilling Co. will drill the Victory Oil & Development Co. 1 Susan & Sylvia Miles, a wildcat, in NE SE NE 6-3n-12w, Allegan County, Michigan.

E. F. Moran Drilling Co. is building substructure and moving in rotary tools on the 1 D. Cooper Estate, SW SW 13-3s-14w, Gibson County, Indiana. The well is a Devonian test for Continental Oil Co.

Clark Drilling Co. has the contract to drill the 1 Ivan McAllister in SW SW NW, 34-6s-9e, White County, Illinois, for H. O. Yoder.

B. M. Heath will drill the C. A. Lynch 2 Joel Vail in NW NW 23-5s-14w, Posey County, Indiana.

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PERSONALS

N. J. McGAW

New Vice President Of Shell Directed War Expansion

WIDE expansion of products pipe lines and development of wartime transportation facilities of Shell Oil Co., Inc. are credited to Norman J. McGaw who has been made general vice president of the company for territory east of the Rocky Mountains.

McGaw joined Shell in 1925 and after service in various departments, was made vice president in charge of transportation and supplies in 1939 in the area east of the Rockies.

The supply and transportation activities which McGaw formerly directed will now be in charge of D. B. Hodges, general manager of the department. Hodges joined Shell nearly 20 years ago and at one time during the war served as associate director of supply and transportation for the Petroleum Administrator for War.

O. J. Stephens, district representative Gulf Oil Corp., has become chairman of the Seminole, Okla., chapter of the American Petroleum Institute following a reorganization. Other officers are **J. E. Jernegan,** field engineer for Stanolind Oil & Gas Co., first vice chairman; **H. S. Spillers,** field engineer for Carter Oil Co., second vice chairman; and **J. F. McDonald,** district engineer for Gulf Oil Corp., secretary-treasurer.

G. R. Preston, assistant treasurer of Cities Service Oil Co., has been awarded the Treasury Department's silver medal "in recognition of patriotic services rendered in behalf of the war finance program." He was a member of the speakers' bureau of the war finance committee. A similar award was presented posthumously to the late R. J. Daugherty, who was superintendent of the public relations department and served as director of war bond sales for the company and as chairman of the speakers' bureau.

Robert E. Morrison has resigned as production geologist for Cities Service Oil Co. in the West Texas district to open a consulting office in Abilene.

C. D. ALWORTH

Cecil D. Alworth, production manager of Standard Oil Co. of Argentina, has returned to Buenos Aires following a short business trip in the United States. **Oscar Serrat,** who was acting production manager in Alworth's absence, is now in the United States and expects to return late in March.

Dr. Horace G. Richards, associate curator of geology and paleontology of the Philadelphia Academy of Natural Sciences, will receive the American Association of Petroleum Geologists' award for a significant contribution to the science at the association's meeting opening April 1 in Chicago. The award is based on his paper on Atlantic Coastal Plain subsurface stratigraphy.

Dr. Frank C. Fowler, formerly with chemical products department of Phillips Petroleum Co., has been appointed assistant professor of chemical engineering at University of Oklahoma. He will do teaching, research, and consulting work. Dr. Fowler took undergraduate work at the University of Illinois and received his master and doctor degrees from the University of Michigan.

T. C. Edwards, chief field geophysicist of Anglo-Iranian Oil Co., Ltd., London, has been visiting oil installations and companies in the United States. He recently left Tulsa on his way to the Bahama Islands where he will direct geophysical surveys in a search for promising oil formations.

Neal Prichard, engineer with Anderson Prichard Oil Corp., has been transferred from Colorado City, Tex., to Oklahoma City.

Samuel F. Bowlby, chief exploitation engineer of Shell Oil Co., Inc., at Los Angeles has been advanced to assistant production manager.

J. D. Davies, senior stratigrapher for Shell Oil Co., Inc., in the Mid-Continent area, Tulsa, has resigned to become associated with **Clinton Engstrand** in establishing Kansas Sample Log Service. This service will offer logs on all important wildcat wells in the state.

G. R. Brainard and **Charles A. Hull** have rejoined Shell Oil Co., Inc., as assistant district superintendents after more than 3½ years' Army service. Brainard, who is stationed in the West Texas division at Odessa, has been with Shell since 1936 and was an exploitation engineer in West Texas and various Gulf Coast fields. Hull also went to work for Gulf in 1936 as an exploitation engineer and is now at McCamey. News of other Shell personnel: **T. M. Ocheltree, Jr.,** has returned to the company as exploitation engineer at Odessa following Army service; **Harold Pierce** has rejoined Shell as exploitation engineer in the Midland office following his release from the Coast Guard; **S. E. Lambert,** formerly exploitation engineer at Tulsa, has been shifted to Houston as senior exploitation engineer in the Texas Gulf area; **G. E. Burpee,** senior exploitation engineer, Lake Charles, has been transferred to the Houston office as chief exploitation engineer and will serve as senior technical adviser and consultant to the production department management.

W. F. Bettis of M. O. Johnston Oil Field Service Co. has been elected president of the Los Angeles chapter of Nomads.

J. Harvey Herd, who was recently separated from the Army Air Forces as a captain, has become associated with **John J. Redfern, Jr.,** Midland,

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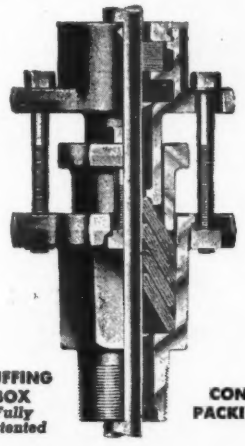

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Tex., independent operator. Before entering the service, Herd was in the land and geological departments of Standard Oil Co. of Texas.

W. H. Ground, landman for Stanolind Oil & Gas Co., has been transferred from Tyler, Tex., to Midland to take charge of the West Texas-Southeast New Mexico district, succeeding **L. G. Yarborough,** who resigned to become an independent operator.

John F. Jones, former assistant counsel of the Kansas Corporation Commission and later attorney for the production division of the Petroleum Administration for War, has resumed practice at Topeka. Jones was released this month after service in the Navy.

Lt. Col. Tom T. Conger, Corps of Engineers, a veteran of 42 months' Pacific service, is now in Shreveport on terminal leave. Prior to the war he was with N. V. Koninklijke Nederlandsche Maatschappij at Pendopo field, Sumatra, where he escaped immediately ahead of the Japanese invasion. Conger expects to resume his work in Java soon.

E. M. Butterworth, Standard Oil Co. of California production official, has been elected president of American Overseas Petroleum Co., succeeding **E. A. Skinner,** who has returned to California Standard. During the war, Butterworth was a special representative for Petroleum Administration for War. American Overseas Co. manages foreign activities of companies jointly owned by California Standard and The Texas Co. except for their Arabian and Bahrein interests.

A. J. Pettigrove, formerly assistant general superintendent of Associated Refineries, Inc., has been appointed to fill the newly created position of chief mechanical engineer of the manufacturing department of Stanolind Oil & Gas Co.

R. L. Kidd, manager of the land and geological division of Cities Service Oil Co. (Del.), and **Frank M. Perry,** manager of the natural gasoline and chemical division, have been elected to the board of directors of the company.

Howard F. Kley, research department engineer in the Martinez, Calif., refinery of Shell Oil Co., Inc., has been advanced to senior engineer and transferred to the company headquarters in San Francisco.

W. H. Geis, geologist and petroleum engineer, has resigned as assistant to the president of Union Oil Co. and opened a consulting office in Los Angeles.

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Equipment Men in the News

Aireon Names Two Vice Presidents

Walter A. Bowers has been elected vice president and treasurer of Aireon Manufacturing Corp., Kansas City, and Arthur E. Welch has been elected vice president in charge of sales. Welch formerly was vice president and treasurer. Bowers goes to Aireon from Lawrance Aeronautical Corp., where he was vice president and treasurer. Prior to joining Lawrance in 1944, he had 15 years in executive and administrative positions in government service.

W. A. BOWERS

A. E. WELCH

Kirkpatrick Named Representative For Petroleum Engineering

C. S. KIRKPATRICK

Comdr. Claude S. Kirkpatrick, recently returned from overseas after an absence of almost 5 years, has been appointed sales representative of Petroleum Engineering, Inc., in Tulsa, according to an announcement made by Paul M. Raigorodsky, vice president and general manager of the company. Kirkpatrick left the firm for active duty in the Navy in March 1941. He commanded various combatant task units in the Atlantic and in the Pacific.

American Chain Names Chief Executive

American Chain & Cable Co., Inc., of Bridgeport, Conn., announces that Wilmot F. Wheeler has been elected president, succeeding the late William T. Morris. Wheeler has been with the company since 1916, and has been executive vice president and treasurer since 1936.

W. F. WHEELER

C. F. JOHNS

Cyrus F. Johns has been elected executive vice president. Johns joined Page Steel & Wire Co., now a division of American Chain & Cable Co., Inc., in 1913, and was made general manager of that division in 1933.

Stanley Mann has been elected treasurer. He has been a director of the company since 1936 and assistant treasurer since 1943.

Helm Gets New Post With Reliance

Edward E. Helm, general sales manager of The Reliance Electric & Engineering Co., Cleveland, is now vice president of the company. He has been with Reliance since he graduated in electrochemical engineering from Pennsylvania State College in 1924.

Forrow Heads Harvey's New Oil-Equipment Division

Following his work as general sales manager for Harvey Machine Co. during the war years, E. W. (Al) Forrow has been named manager of the oil-equipment division. Forrow's work in the oil and oil-equipment business goes back to 1919, and includes work with Union Oil Co., Byron Jackson, and 11 years as vice president and general sales manager of Security Engineering Co., Inc.

Halliburton Announces Tulsa Representative

John W. Woods, field man from the Tallahassee, Fla., area, has recently been transferred to the Halliburton Oil Well Cementing Co. office in the Philtower Building, Tulsa. He will act as district representative. Woods states that he has a definite preference for "land" jobs over the "water" jobs such as he encountered in his work in Florida and the Gulf Coast. However, his thorough knowledge of both types of operations makes him especially well-prepared for the new position.

Winslow Will Represent Four Firms in South America

Appointment of W. G. Winslow as South American sales representative for their products has been announced by four American manufacturers. He will handle sales of Falk Corp.'s speed reducers and flexible couplings, Monitor Controller Co.'s electric motor controls, Reliance Electric & Engineering Co.'s motors and generators, and Union Chain & Manufacturing Co.'s chains and sprockets.

From his headquarters in Sao Paulo, Brazil, Winslow will establish distributors in several industrial centers of the principal South American equipment markets.

Morris Chief Engineer For O. M. S. Co.

W. D. "Dixie" Morris, recently relieved from active service with the Air Corps, has been named chief engineer of the Oilfield Machine & Supply Co., Houston. He will continue development of the well purger and other specialized oil industry equipment manufactured by the firm.

Wagner Announces Changes

Wagner Electric Corp., St. Louis, announces branch manager and sales territory changes in its electrical sales division. The Kansas City territory is divided into two parts. The southern portion, comprising Texas, Oklahoma, and parts of New Mexico, Arkansas, and Louisiana, is now the Houston branch office territory, with suboffices at Dallas and Tulsa, with L. J. Dicianne as branch manager.

The northern portion continues to be known as the Kansas City branch office territory and is now limited to Kansas and Nebraska and the western halves of Iowa and Missouri, with A. G. Viola as branch manager. Viola was transferred from the Pittsburgh territory where he was branch manager since 1939. J. L. Pasher is now in charge of both the electrical and automotive divisions at Pittsburgh.

Kerr Named Vice President Rockwell Manufacturing Co.

A. J. Kerr, formerly general sales manager, has been elected vice president of sales of Rockwell Manufacturing Co., Pittsburgh. He has been associated with the company for more than 20 years. His early career was as district manager, Tulsa office, of Pittsburgh Equitable Meter and Nordstrom Valve companies, now divisions of Rockwell Manufacturing Co. In 1944 he was made general sales manager.

Thomas Opens Tulsa Office

Morvin (Mique) Thomas has opened an office in the Thompson Building, Tulsa, and will offer sales and engineering service to the oil industry as representative of Cook Electric Co. of Chicago, and Federal Electric Co. of Chicago.

MacClatchie Opens Casper Office

MacClatchie Manufacturing Co., Compton, Calif., announce the opening of a new sales office and warehouse at 133 North Wilcott Street, Casper, Wyo. Cliff Ford is in charge of the new office as factory representative. He formerly held a similar position with MacClatchie in the West Texas area.

Three Directors Elected

George L. Miller, J. A. Moore, and John A. Hendershot have been elected directors of Oil Base, Inc., manufacturers of oil-well drilling fluids and equipment.

Curtis Joins Earlougher

Ralph D. Curtis recently resigned from Barnsdall Oil Co. to join Earlougher Engineering Co. as valuation-appraisal and pressure maintenance engineer at Tulsa.